

Summary Report

Aerial Photograph Anomaly 44

Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro, California

3 November 2000

Prepared by
Southwest Division, Naval Facilities Engineering Command
BRAC Program Office
1230 Columbia Street, Suite 870
San Diego, CA

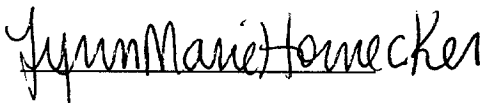
Summary Report

Aerial Photograph Anomaly 44

Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro, California

3 November 2000

Prepared by:

A handwritten signature in black ink that reads "Lynn Marie Hornecker". The signature is written in a cursive style with a horizontal line drawn across the middle of the name.

Lynn Marie Hornecker
Civil Engineer

Southwest Division, Naval Facilities Engineering Command
BRAC Program Office
1230 Columbia Street, Suite 870
San Diego, CA

TRANSMITTAL

Date: 3 November 2000

From: Lynn Marie Hornecker 

To: **Ms. Triss Chesney**
State of California Environmental Protection Agency
Department of Toxic Substances Control, Region 4
Site Mitigation Branch, Base Closure Unit
5796 Corporate Avenue
Cypress, CA 90630

Subj: Aerial Photograph Anomaly APHO 44 (SAIC 288)
Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro

Transmitted as the attachment are three (3) copies of the Summary Report for the aerial photograph anomaly - APHO 44 - at the Marine Corps Air Station, El Toro. APHO 44 was identified by Science Applications International Corporation (SAIC) as SAIC anomaly number 288 (SAIC 288) during the review of an aerial photograph taken in 1974. SAIC described the anomaly as disturbed ground, mounded material, and a probable trench, and the anomaly is located west of Installation Restoration Program (IRP) Site 17 - the Communication Station Landfill. APHO 44 encompasses an area of approximately 2 acres and the APHO 44 investigation area encompassed approximately 9 acres.

The Summary Report includes an evaluation of historical records, a description of information collected during the investigation of nearby Environmental Locations of Concern, the results of the visual inspections of the site, and the results of a geophysical survey of the 9-acre APHO 44 investigation area.

Based upon the review of the historical information and the findings of the visual inspections and geophysical survey, we believe that the appearance of disturbed ground, mounded material, and/or probable trenches on the 1974 photograph may have been attributable to non-routine placement of construction debris in the general vicinity of APHO 44. A larger construction debris disposal area was identified near the southern section of IRP Site 17, and this debris will be excavated and consolidated in the former operational area of the landfill during the implementation of the final remedy at IRP Site 17. The geophysical survey did not identify trench or excavation features within the APHO 44 investigation area, however, numerous scattered surface and subsurface anomalies were identified. Construction debris, including concrete and metallic debris, was observed on the ground surface.

We recommend that the scattered surface construction debris and any subsurface debris at the APHO 44 investigation area be removed and consolidated with the construction debris that is planned for consolidation during the implementation of the final remedy at IRP Site 17. Based upon the findings of our investigation and our recommendation to consolidate debris from the APHO 44 vicinity during the implementation of the final remedy at IRP Site 17, we recommend that *no further action status* be designated for APHO 44 (SAIC 288) in the next Base Realignment and Closure Business Plan Update.

If we do not receive comments from you within sixty (60) days of receipt of this document, then we will assume that you concur with our recommendations and we will continue with our evaluation of various aerial photograph anomaly sites. A formal transmittal letter may follow.

Please do not hesitate to call me at (619) 532-0783 if you have questions pertaining to this project. Thank you very much.

Attachment

Summary Report, APHO 44 (SWDIV, November 2000)

CF:

Glenn Kistner (USEPA) w/ atch
John Broderick (RWQCB) w/ atch
Dean Gould (MCAS El Toro) w/atch
Project file (El Toro)

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Section 1

Introduction

The purpose of this Summary Report is to present information pertaining to the aerial photograph anomaly, designated as APHO 44 in the Base Realignment and Closure (BRAC) Cleanup Plan (BCP) of 1999 and in the BRAC Business Plan of 2000, located adjacent to the southwestern section of Installation Restoration Program (IRP) Site 17 – the Communication Station Landfill - in the northeastern section of the Marine Corps Air Station (MCAS), El Toro. APHO 44 was identified by Science Applications International Corporation (SAIC) as SAIC 288 during a review of historical aerial photographs, and the findings of the SAIC review are published in the *Final Report, Aerial Photograph Assessment, MCAS El Toro* (SAIC, 1993). APHO 44 is described as disturbed ground (DG), mounded material (MM), and a probable trench (TR) approximately 700 feet southeast of the Perimeter Road and Quarry Road intersection. APHO 44 is approximately 200 feet wide and 400 feet long (approximately 2 acres), and the investigation area comprised a larger area of approximately 9 acres. Geophysical surveys were conducted over the larger investigation area due to visual observations of construction debris at the ground surface in the area adjacent to and surrounding APHO 44. APHO 44 (SAIC 288) was identified on an aerial photograph dated 9 December 1974.

The Marine Corps Air Station, El Toro, also known as the Station, comprises approximately 4,700 acres and is located in eastern Orange County approximately 45 miles southeast of Los Angeles, California. APHO 44 is located west of IRP Site 17 – the Communication Station Landfill and south of Tank Farm 555 as shown on Figure 1. The survey area is shown on Figure 2.

The Station was closed on 2 July 1999 in accordance with the Base Realignment and Closure Act of 1993 (BRAC III). APHO 44 is located within a parcel tentatively identified as recreation or habitat areas according to *The Preferred Land Use Plan* (County of Orange, August 1999) as shown on an exhibit in the Appendix.

This Summary Report includes an evaluation of historical records, a description of information collected during the investigation of nearby Environmental Locations of Concern, the results of a geophysical survey of a 9-acre area that included APHO 44, and the results of the visual inspections of the site. The geophysical survey identified several areas of surface and subsurface debris, however, no trench features were identified. Construction debris, including concrete and metallic debris, was observed on the ground surface within the APHO 44 investigation boundary. Similar construction debris is present at the southern end of IRP Site 17, and this debris will be consolidated during the implementation of the final remedy at IRP Site 17.

It is recommended that the surface debris within the APHO 44 investigation boundary be managed during the planned consolidation activities at the adjacent IRP Site 17.

A stockpile for clean soil that was removed from the channel near IRP Site 17 in 1997 prior to placement of armor stone along the channel is located near the eastern edge of the APHO 44 investigation area. This stockpile could be considered mounded material, a feature associated with APHO 44, however, it would not have been visible on the 1974 photograph on which APHO 44 was identified.

Based upon the review of the historical information and recently collected geophysical survey data, the absence of evidence of current or recent areas of disturbed ground or trenches, and the planned remedial actions for IRP Site 17, it is recommended that *no further action status* be designated for APHO 44 (SAIC 288) in the next BRAC Business Plan Update.

Section 2

Field Inspections and Historical Records

APHO 44 (SAIC 288), identified on a photograph dated 9 December 1974, is described by SAIC as follows: *"Disturbed ground (DG), mounded material (MM) and probable trench (TR) can be seen about 700 feet southeast of the Perimeter Road and Quarry Road intersection. The purpose of the features is unknown, and investigation of the site history as a possible disposal area is recommended."*

2.1 Field Inspections and Surveys

Visual Inspection of APHO 44 Vicinity

The vicinity of APHO 44 was visually inspected by the Navy in June and October 2000. APHO 44 is an unpaved, level area with a grass cover. No stains or discolored areas were observed, and no evidence of recent ground disturbances or trenches was observed. APHO 44 is located adjacent to Installation Restoration Program (IRP) Site 17 (Communication Station Landfill), and nearby Environmental Locations of Concern are shown on Figure 2. Monitoring wells 17NEW1 and 17_DGMW82 and lysimeter 17LYS3 are located near the APHO 44 investigation boundary.

Small areas of construction debris, including concrete rubble and metallic debris, were observed on the ground surface during the visual inspections of the site. Construction debris is also present at the southern end of IRP Site 17. It is possible that construction debris was accidentally placed on the ground surface near or at APHO 44 during the transport of debris to the southern section of IRP Site 17.

Soil was stockpiled near the APHO 44 investigation area during the implementation of the time-critical removal actions at IRP Site 17 during 1997. The removal actions included surface drainage improvements and debris removal. Soil that was removed

from the drainage channel area in order to prepare the channel for the placement of armor stone was stockpiled near the southwestern end of IRP Site 17. The stockpile would not have been visible on the 1974 photograph.

A check list form documenting conditions during the visual inspections and photographs of the vicinity of APHO 44 are presented in the Appendix.

Geophysical Survey of APHO 44 Vicinity

A geophysical survey was conducted at APHO 44 during the time period from May to early July 2000 under Navy Contract N68711-93-D-1459, DO #70. The survey, conducted by GEOVISION Geophysical Services for OHM Remediation Services (OHM), utilized magnetic, electromagnetic (EM) induction, and ground penetrating radar (GPR) methods. The survey area was larger than the APHO 44 investigation area (approximately 9 acres), and the survey area included the southwestern edge of IRP Site 17. The geophysical surveys were designed to detect buried metallic debris and/or areas of non-native fill materials. It was assumed that buried construction debris would include metallic debris that could be identified using the selected survey methods.

The survey identified several areas of small shallow anomalies –possibly concrete or metallic debris – within the area designed as APHO 44 (SAIC 288) in the SAIC report. The survey area boundary and surface and subsurface anomaly locations are shown on Figure 2. The geophysical survey report, which includes several maps of the investigation area, is presented in the Appendix. The survey identified buried metallic debris over an area of approximately 1 acre in the southeastern part of the investigation area (Survey Areas A1 and A2), east of the APHO 44 (SAIC 288) boundary identified by SAIC. Survey Area A1 was described as “significant amounts of buried metallic debris.” The survey identified scattered surface debris and small buried debris items within the boundary of APHO 44 as defined by SAIC. The survey also identified the two JP-5 pipelines at the northern part of the investigation area.

The geophysical surveys did not identify trenches or large areas of fill.

2.2 Historical Environmental Program Records

Records of previously completed environmental restoration program investigations were acquired and reviewed, and several Environmental Locations of Concern are located in the vicinity of APHO 44. A description of the types of data collected near APHO 44 at adjacent Environmental Locations of Concern is presented in Table 1.

Table 1. Investigation Activities at or near APHO 44.

Location of Concern	Status	NFA or other Decision Document(s)	Comments/ Description of data
IRP Site 17 Communication Station Landfill	Remedial design is in progress as of October 2000	Interim Record of Decision (ROD) completed in 2000	Field sampling was conducted during the RI. Further investigation of IRP Site 17 and the adjacent APHO 44 is planned under the Historical Radiological Assessment Program. The APHO 44 investigation boundary is adjacent to the IRP Site 17 boundary. APHO 44 is contained within a 1,000-foot buffer zone surrounding the estimated boundary of IRP Site 17.
Tank Farm 555 USTs 547, 548, 549, 550, and 551	Evaluation and/or remediation activities are in progress as of October 2000		Field sampling, including soil and groundwater sampling, has been conducted. Reports have been submitted to the RWQCB Santa Ana Region.
Tank Farm 555 USTs 553 and 554	NFA	RWQCB letter dated 19 November 1997	USTs 553 and 554 were removed in 1993. Field sampling was conducted during and after tank removal activities.
Tank Farm 555 UST T-1	NFA	OCHCA letter dated 31 August 2000	Field sampling was conducted during tank removal activities.
UST 568	NFA	OCHCA letter dated 25 July 2000	Field sampling was conducted during tank removal activities.
Primary JP-5 Pipelines (MSC-JP5)	Closure and site verification activities are in progress as of October 2000		
Ground Water Data Monitoring wells were constructed at and near IRP Site 17 and Tank Farm 555.	See comments.		Routine groundwater monitoring reports have been submitted to the BCT (for IRP Site 17) or to the RWQCB Santa Ana Region (for Tank Farm 555).

Resource Conservation and Recovery Act Facility Assessment (RFA)

No Solid Waste Management Units (SWMUs) were identified in the immediate vicinity of APHO 44 during the Resource Conservation and Recovery Act Facility Assessment (RFA). Results of the RFA are published in the *Installation Restoration Program, Final Resource Conservation and Recovery Act Facility Assessment Report for Marine Corps Air Station, El Toro, California* (Jacobs Engineering Group, 1993).

Underground Storage Tank (UST) Program

UST 568, a former diesel fuel tank for the emergency generator at the transmitter facility at Building 568 that is located on Communication Station Hill north of APHO 44, was removed in January 2000. Confirmation sampling activities were conducted with Orange County Health Care Agency (OCHCA) oversight and OCHCA issued a letter designating no further action status on 25 July 2000.

UST T-1, a former waste JP-5 storage tank, located within the Tank Farm 555 facility was removed in June 2000. Confirmation sampling activities were conducted with Orange County Health Care Agency (OCHCA) oversight and OCHCA issued a letter designating no further action status on 31 August 2000.

The large fuel storage tanks, USTs 547, 548, 549, 550, and 551, are inactive. Data from previous site verification activities is being evaluated and remediation activities are in progress as of November 2000.

Installation Restoration Program (IRP)

The former operational landfill unit at IRP Site 17 encompasses approximately 11 acres, and IRP Site 17 is located east of APHO 44. An interim Record of Decision (ROD) was signed in the year 2000, and the ROD states that a single-layer soil cap will be constructed over the former operational landfill unit for the final remedy. The final remedy also includes the removal of waste material (construction debris) from selected areas south of and adjacent to the former operational landfill unit with consolidation of the removed material in the former operational landfill unit. The Draft Final Feasibility Study Report for IRP Site 17 identifies approximately 14,500 cubic yards of material (construction debris) for consolidation.

BRAC Cleanup Plan (BCP) and BRAC Business Plan Information

The 1999 BCP (Tables 3-1a, 3-1b, and 3-2) and the Year 2000 Business Plan (Tables 2 and 3) describe the aerial photograph anomaly sites. Extracts for APHO 44 from the BCP and Business Plan are presented in the Appendix. The BCP and Business Plan tables include descriptions of APHO 44 that are very concise. The anomaly is described as disturbed ground, mounded material, and trench.

It is recommended that the comments field in the summary table in the next Business Plan Update be revised to identify the location of the anomaly according to the

description in the SAIC report as follows: "APHO 44 (identified as SAIC 288 on a photograph dated 9 December 1979) is described as disturbed ground, mounded material, and probable trench located west of IRP Site 17."

Aerial Photograph Anomaly Program

The United States Environmental Protection Agency (USEPA) and Science Applications International Corporation (SAIC) evaluated historical aerial photographs of the Marine Corps Air Station, El Toro and the results of the evaluations are published in the *Site Analysis, El Toro MCAS, Orange County, California* (USEPA, 1991) and the *Final Report, Aerial Photograph Assessment, MCAS El Toro* (SAIC, 1993). Extracts pertaining to APHO 44 (SAIC 288) from the SAIC report are presented in the Appendix.

Environmental Baseline Survey (EBS)

The Final Environmental Baseline Survey (EBS) Report (JEG, 1995) did not identify temporary hazardous waste accumulation areas or other locations of concern within the APHO 44 investigation area. Extracts from the EBS are included in the Appendix.

Hazardous Material/Hazardous Waste Management Plan

The Station's Hazardous Material/Hazardous Waste Management Plan (HM/HWMP) was reviewed and extracts pertaining to the vicinity of APHO 44 are presented in the Appendix. The HM/HWMP does not identify temporary storage of hazardous materials or wastes in the APHO 44 vicinity.

Storm Water Pollution Prevention Plan

The Station's Storm Water Pollution Prevention Plan (SWPPP) was reviewed and extracts from the SWPPP for the vicinity of APHO 44 are presented in the Appendix of this report. No hazardous substance storage areas are identified within the APHO 44 investigation area.

Surface water from the APHO 44 vicinity discharges to Agua Chinon Wash. The surface drainage channels, including Agua Chinon Wash, were investigated during the Remedial Investigation of Installation Restoration Program Site 25 – the Major Drainages. A Comprehensive Environmental Response, Compensation, and Liability Act Record of Decision identifying no action for IRP Site 25 was signed in 1997.

Historical Radiological Assessment Program

IRP Site 17 and the adjacent APHO 44 were identified for further investigation in the Final Historical Radiological Assessment (HRA), Marine Corps Air Station, El Toro (Weston, May 2000).

2.3 Historical Property Records

Property records including the Station's plant account data base were acquired and reviewed, and information pertaining to structures located near APHO 44 is

summarized in Table 2. The 1954, 1958, and 1978 station maps were reviewed, and these maps did not show structures within the APHO 44 study area.

Table 2. MCAS El Toro Property Records for APHO 44 Vicinity.

Building Identification Number	Approximate year of acquisition or construction	Type of Use	Comments
Building 568	1956	Standby Generator Building	
Building 394	1956	Transmitter Building	

2.4 Ground Water Conditions

Ground water conditions have been investigated in the vicinity of APHO 44 during the Remedial Investigation at IRP Site 17 and during the verification activities at former Tank Farm 555. Ground water is located approximately 185 feet below ground surface based upon measurements from nearby wells, and the gradient is approximately southwest. Subsurface soils consist primarily of silt, sand, silty sand, and sandy clay; and lithological logs for borings near APHO 44 are included in the Appendix. Low levels of petroleum hydrocarbons and volatile organic compounds were identified in groundwater samples collected from wells near APHO 44. Selected ground water information is presented in the Appendix, and a conceptual site model is shown on Figure 3.

The nearest Installation Restoration Program (IRP) monitoring wells, 17NEW1 and 17_DGMW82, are located near the southeastern section of the APHO 44 investigation area.

Section 3

Findings and Recommendations

The following findings are based upon information collected during the record search activities and from observations during the visual inspections of the APHO 44 vicinity:

- SAIC described APHO 44 (also known as SAIC 288) as follows: "*Disturbed ground (DG), mounded material (MM) and probable trench (TR) can be seen about 700 feet southeast of the Perimeter Road and Quarry Road intersection. The purpose of the features is unknown, and investigation of the site history as a possible disposal area is recommended.*"
- The APHO 44 descriptions in the BCP and BRAC Business Plan are very concise and the following expanded description to include the location of the anomaly is recommended for the next BRAC Business Plan Update: "*APHO 44 (identified as SAIC 288 on a photograph dated 9 December 1979) is described as disturbed ground, mounded material, and probable trench located west of IRP Site 17.*"
- A radiological survey of IRP Site 17 and APHO 44 was recommended in the Final

Historical Radiological Assessment.

- The Hazardous Material/Hazardous Waste Management Plan and the Storm Water Pollution Prevention Plan do not identify storage of hazardous wastes or hazardous materials at APHO 44.
- A geophysical survey, including magnetic, electromagnetic, and ground penetrating radar methods, was conducted over a 9-acre area that included APHO 44 during the May through July 2000 time period. No evidence of trenches or areas of filled excavations was identified. Several areas of scattered surface and subsurface debris were identified, and a 2-acre area of buried metallic debris were identified.
- The APHO 44 vicinity was visually inspected by Navy representatives in June and October 2000, and no evidence of trenches, disturbed ground, fill areas, stains or discolored areas, or stored items was observed. A stockpile of clean soil is located near the eastern boundary of the investigation area, and this stockpile could be considered mounded material. The stockpile was established in 1997 and would not have been visible on the 1974 aerial photograph on which APHO 44 was identified.
- APHO 44 is located near the southwestern section of IRP Site 17, and consolidation of approximately 14,500 cubic yards of debris is planned as part of the final remedy for IRP Site 17. It is recommended that construction debris within the APHO 44 study area be consolidated in a similar manner to the debris identified for consolidation at IRP Site 17 during the implementation of the final remedy.

Based upon the results of the evaluation of historical records, the results of the visual inspections and geophysical survey, the absence of evidence of trenches, fill areas, or excavations at APHO 44, and the planned future remediation and consolidation activities at IRP Site 17 (the Communication Station Landfill), it is recommended that *no further action status* be designated for APHO 44 (also known as SAIC 288) and that *no further action status* be documented in the next BRAC Business Plan Update.

Section 4

References and/or Sources of Information

Bechtel National, Incorporated. 1997. Draft Final Phase II Remedial Investigation Report, Operable Unit 2B – Site 17, Marine Corps Air Station, El Toro, California. April. [Navy Contract N68711-92-D-4670, CTO 76]

Bechtel National, Incorporated. 1997. Draft Final Phase II Feasibility Study Report, Operable Unit 2B – Site 17, Marine Corps Air Station, El Toro, California. September [Navy Contract N68711-92-D-4670, CTO 76]

California Environmental Protection Agency, Department of Toxic Substances Control. 1999. Correspondence. Letter to Marine Corps Air Station, El Toro dated May 12, 1999 with Comments on Technical Memorandum, Aerial Photograph Anomalies, Marine Corps Air Station, El Toro.

CDM Federal Programs Corporation. 1998. Final Groundwater Monitoring Report, October 1997 Sampling Round, Groundwater Monitoring Program for Marine Corps Air Station, El Toro. [Navy Contract N68711-96-D-2029, Delivery Order 5]

CDM Federal Programs Corporation. 2000. Final Groundwater Monitoring Report, October-November 1998, Round 8 Sampling, Marine Corps Air Station, El Toro. May. [Contract Number GS-10F-0227J, Delivery Order N68711-00-F-0102]

County of Orange. 1998. The Airport and Open Space Plan, Year 2020, Concept C. August. [prepared by the MCAS El Toro Local Redevelopment Authority]

County of Orange. 1999. Preferred Land Use Plan, Concept B. August. [prepared by the MCAS El Toro Local Redevelopment Authority]

Department of the Navy, Naval Facilities Engineering Command, Western Division, San Bruno. 1978. MCAS El Toro, Santa Ana, California, General Development Map. [NAVFAC Drawing Number 6066343]

GEOVISION Geophysical Services. 2000. Geophysical Investigation, Aerial Photograph Anomaly Area 44, MCAS El Toro. July. [Prepared by GEOVISION for The IT Group, Navy Contract N68711-93-D-1459, Delivery Order 70]

Integrated Environmental Management (IEM). 1997. Storm Water Pollution Prevention Plan (SWPPP) for Marine Corps Air Station, El Toro, El Toro, California. July. [Contract No. N68711-96-D-2059, Delivery Order Number 0002] *{Annotation: The IEM planning document included the acquisition and review of historical and current plans of facilities and utilities. Extracts from the IEM report are presented in the Appendix.}*

Jacobs Engineering Group (JEG). 1993. Installation Restoration Program, Final Resource Conservation and Recovery Act Facility Assessment Report for Marine Corps Air Station, El Toro, California. [Navy Contract N68711-89-D-9296, Contract Task Order 193]

Jacobs Engineering Group (JEG). 1993. Marine Corps Air Station, El Toro: Installation Restoration Program, Phase I Remedial Investigation Technical Memorandum. [Navy Contract N68711-89-D-9296, Contract Task Order 145]

Jacobs Engineering Group (JEG). 1995. Marine Corps Air Station, El Toro, El Toro, California, Final Environmental Baseline Survey Report. April. [Navy Contract N68711-89-D-9296, Contract Task Order 284]

Roy F. Weston. 2000. Final Historical Radiological Assessment, Marine Corps Air Station, El Toro.

Science Applications International Corporation (SAIC). 1993. Final Report, Aerial Photograph Assessment, MCAS El Toro, Contract N68711-91-D-4658, Delivery Order 0002, SAIC Project No. 01-0892-0817.

Science Applications International Corporation (SAIC). 1994. Final Hazardous Material/Hazardous Waste Management Plan. August.

Southwest Division, Naval Facilities Engineering Command. 2000. Technical Memorandum, Groundwater Data Summary, Petroleum Storage Facilities at Various Locations, December 1999 Sampling Activities, Marine Corps Air Station, El Toro, California. April.

Southwest Division, Naval Facilities Engineering Command. 1999. Technical Memorandum, Aerial Photograph Anomalies, Marine Corps Air Station, El Toro, California. April.

United States Environmental Protection Agency. 1991. Site Analysis, El Toro MCAS, Orange County, California.

United States Marine Corps Air Station, El Toro. 1999. Base Realignment and Closure (BRAC) Cleanup Plan.

United States Marine Corps Air Station, El Toro. 2000. Base Realignment and Closure (BRAC) Business Plan.

U.S. Marine Corps Air Station, El Toro. 1997. Draft Final Record of Decision, Operable Units 2A and 3A, No Action Sites, Marine Corps Air Station, El Toro, California. September.

United States Marine Corps Air Station, El Toro, Public Works Department. 1954 and 1958 Installation Maps.

United States Marine Corps Air Station, El Toro. Circa 1946-1999. Station Property Records and Utility Drawings.

Figures

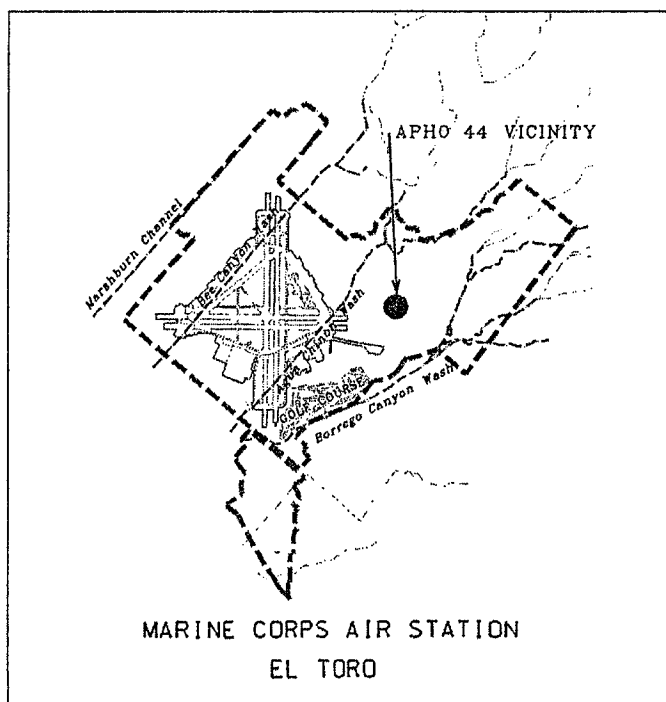
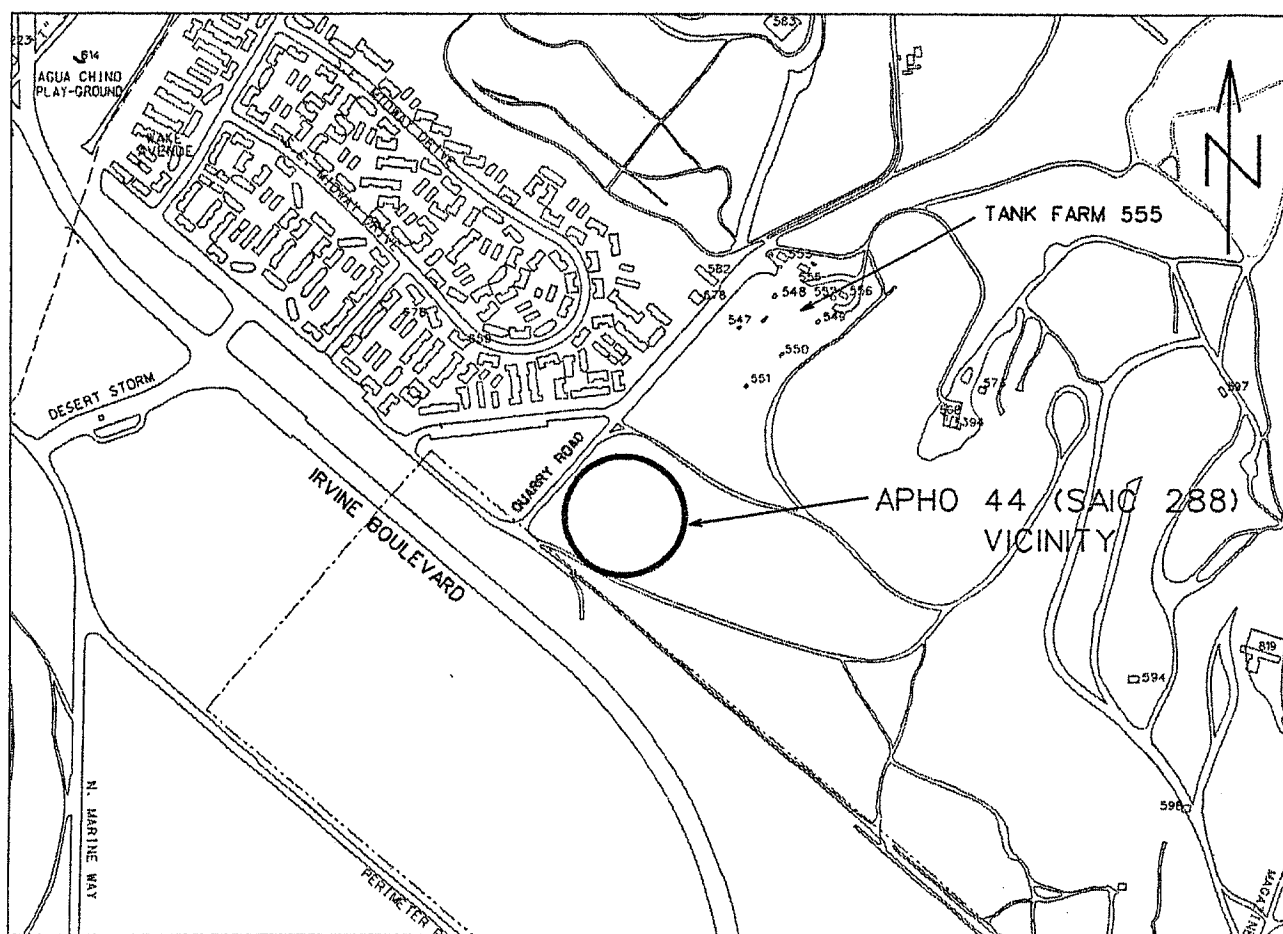
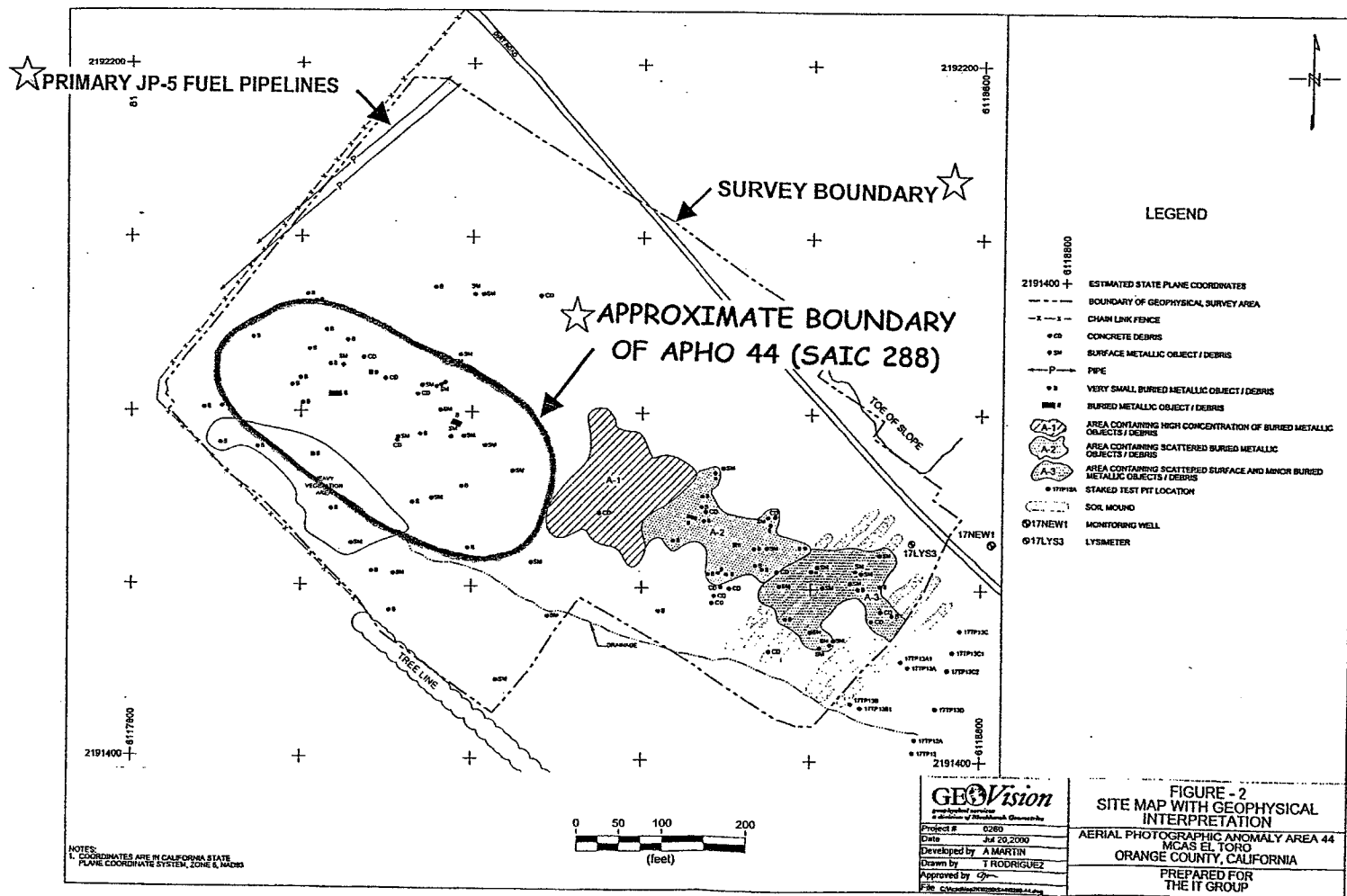


Figure 1.

AERIAL PHOTOGRAPH ANOMALY PROGRAM

APHO 44 VICINITY MAP

MARINE CORPS AIR STATION, EL TORO



Source of Map Information:
Geophysical Investigation
(Geovision, 2000)

NOTE: ANNOTATIONS MADE BY THE
WRITER OF THE APHO 44 REPORT
ARE IDENTIFIED WITH AN ARROW OR
A STAR SYMBOL: ☆

Figure 2.
AERIAL PHOTOGRAPH ANOMALY PROGRAM

APHO 44 SURVEY AREA

MARINE CORPS AIR STATION, EL TORO

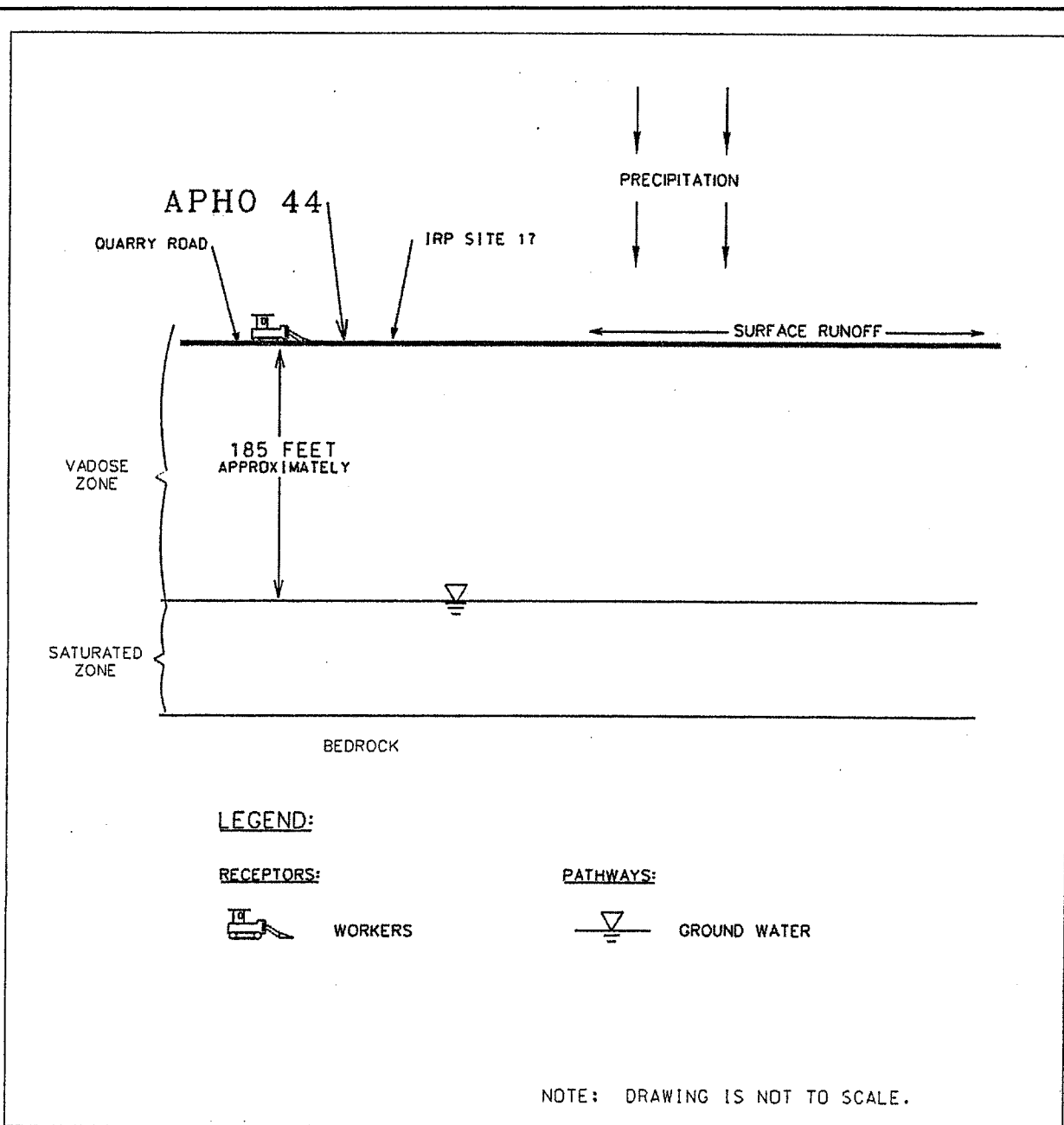


Figure 3.

AERIAL PHOTOGRAPH ANOMALY PROGRAM

APHO 44 CONCEPTUAL SITE MODEL

MARINE CORPS AIR STATION, EL TORO

Appendix

Site Photographs and Other Documentation

Site Photographs

Check List Form

Exhibits

Extracts from Base Realignment and Closure Cleanup Plan (BCP) and
BRAC Business Plan

Extracts from the EBS

Extracts from SAIC Study

Extracts from SWPPP

Extracts from HM/HWMP

No Further Action Documents (Closure Letters) for Nearby Environmental
Locations of Concern and Ground Water Information

Geophysical Investigation Report (Geovision, July 2000)

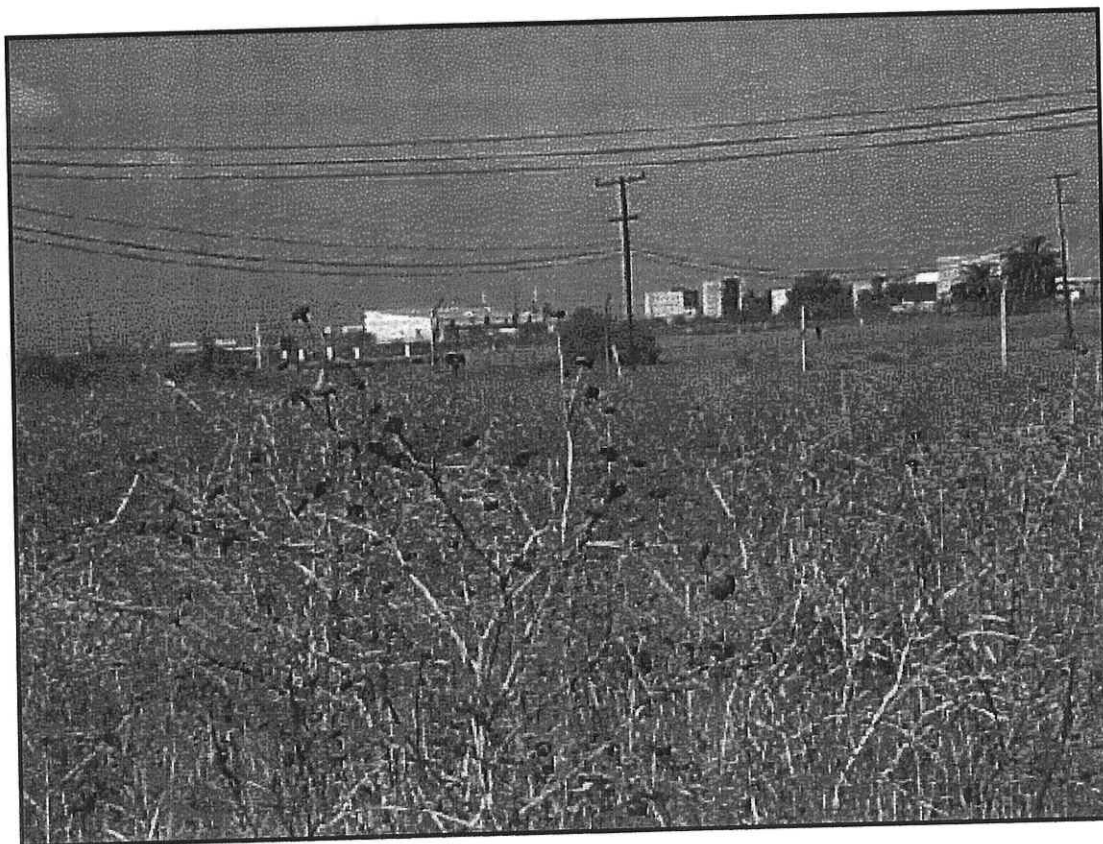
SITE PHOTOGRAPHS

SUMMARY REPORT AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

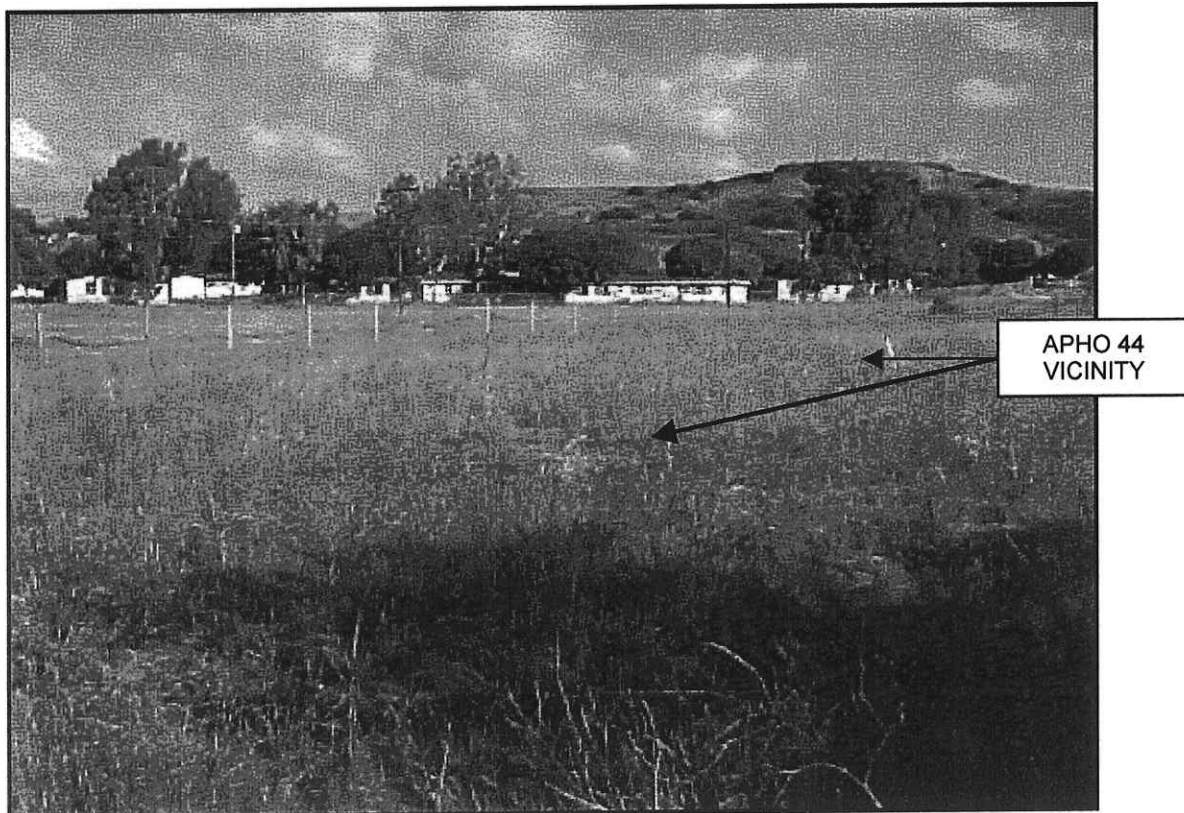
Photograph 1. APHO 44 (SAIC 288 (1974 Photograph)) Vicinity.
Disturbed Ground, Mounded Material, and Probable Trench
Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro

Date of Photograph: 31 October 2000



Photograph 2. APHO 44 (SAIC 288 (1974 Photograph)) Vicinity.
Disturbed Ground, Mounded Material, and Probable Trench
Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro

Date of Photograph: 31 October 2000



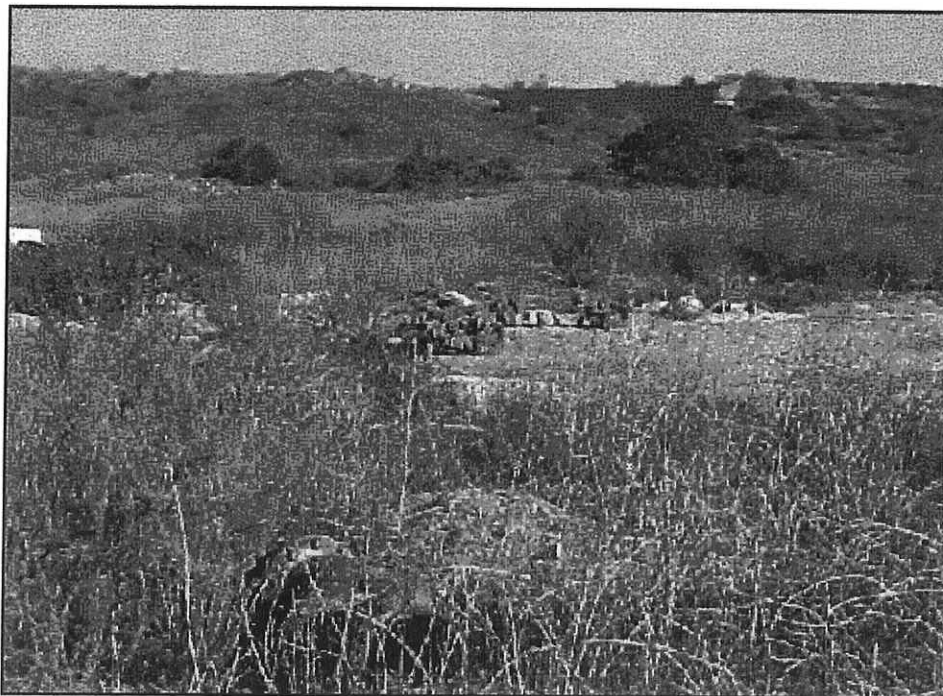
Photograph 3. APHO 44 (SAIC 288 (1974 Photograph)) Vicinity.
Disturbed Ground, Mounded Material, and Probable Trench
Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro

Date of Photograph: 31 October 2000



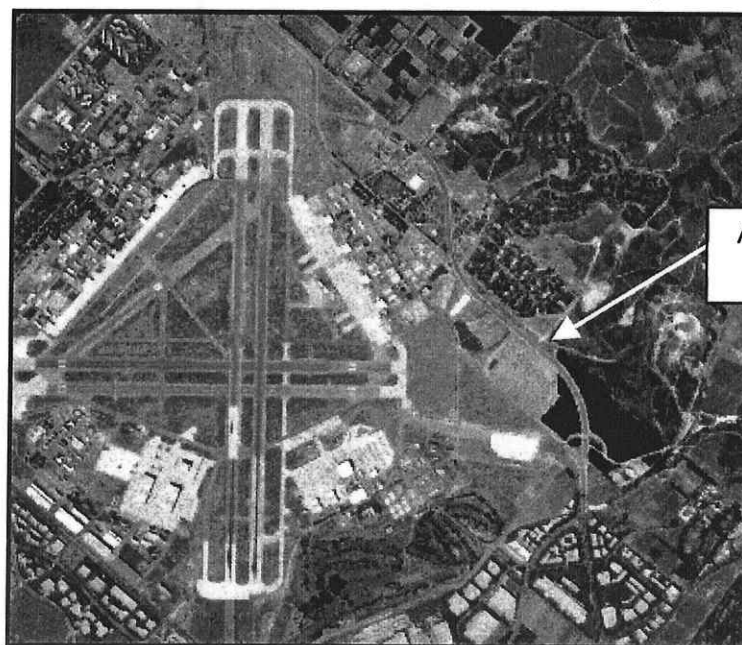
Photograph 4. Installation Restoration Program (IRP) Site 17 -
Communication Station Landfill, Southern Area (Construction Debris)
(East of APHO 44 (SAIC 288))
Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro

Date of Photograph: 2 November 2000



Photograph 5. APHO 44 (SAIC 288 (1974 Photograph)) Vicinity.
Disturbed Ground, Mounded Material, and Probable Trench
Aerial Photograph Anomaly Program
Marine Corps Air Station, El Toro

Date of Photograph: 1994



APHO 44
Vicinity

CHECK LIST FORM

SUMMARY REPORT AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

CHECK LIST

Aerial Photograph Anomaly Program, Marine Corps Air Station, El Toro

Anomaly Identification Information:

Date of Photograph: 9 December 1974

APHO (from the BRAC Cleanup Plan)	SAIC	EPA
44	288	

Recommendation: *No Further Action Status*

Anomaly Description (from source document(s) *Site Analysis, El Toro MCAS (EPA, 1991) or Final Report, Aerial Photograph Assessment (SAIC, 1993)*):

SAIC 288: *"Disturbed ground (DG), mounded material (MM) and probable trench (TR) can be seen about 700 feet southeast of the Perimeter Road and Quarry Road intersection. The purpose of the features is unknown, and investigation of the site history as a possible disposal area is recommended."*

Visual Inspection Date (s): **27 and 31 October 2000**

Participant(s) (with affiliation(s)) in inspection(s):

Lynn Marie Hornecker (US Navy)

Scott Kehe (US Navy)

Current Site Conditions: *APHO 44 (SAIC 288) is located west of IRP Site 17 and adjacent to Quarry Road. The area is relatively level and grasses and weeds cover much of the surface area. Scattered construction debris items were observed on the ground surface. There are several large shrubs near the southern boundary of the anomaly investigation area.*

A large stockpile of clean soil is located near the eastern boundary of the anomaly investigation area. Also, a lysimeter and two monitoring wells for IRP Site 17 are located near the eastern boundary of the anomaly investigation area.

Is there visual evidence of the anomalies identified in the photograph present at the site? *No areas of disturbed ground or trenches were observed, however, the stockpile of clean soil located near the southeastern section of the investigation area could be considered mounded material.*

Is there evidence of past releases? *No.*

Are there indications of potential or current releases? *No.*

Description of photograph(s): *Photographs show the APHO 44 vicinity.*

Date of preparation of check list: **28 October 2000**

EXHIBITS

SUMMARY REPORT AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

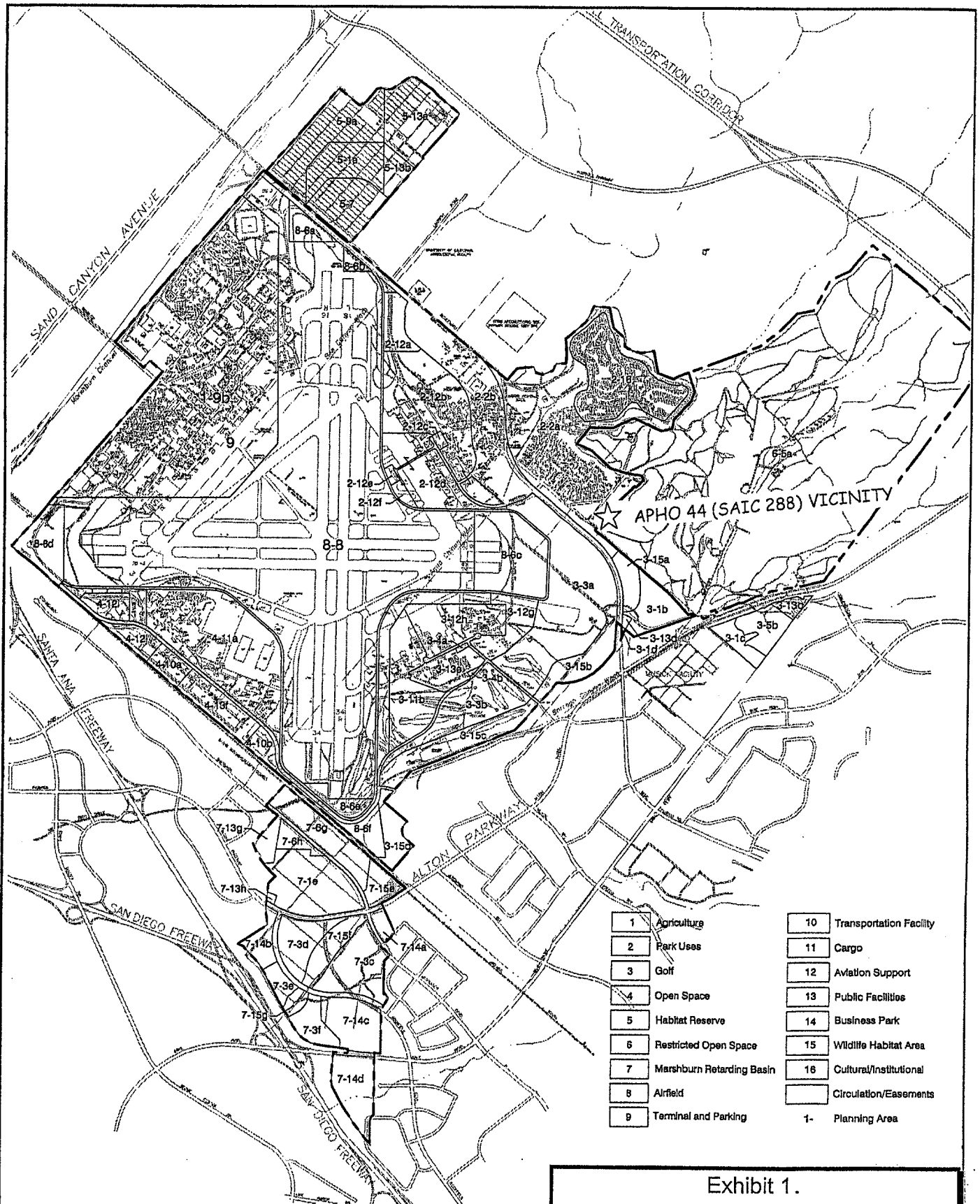
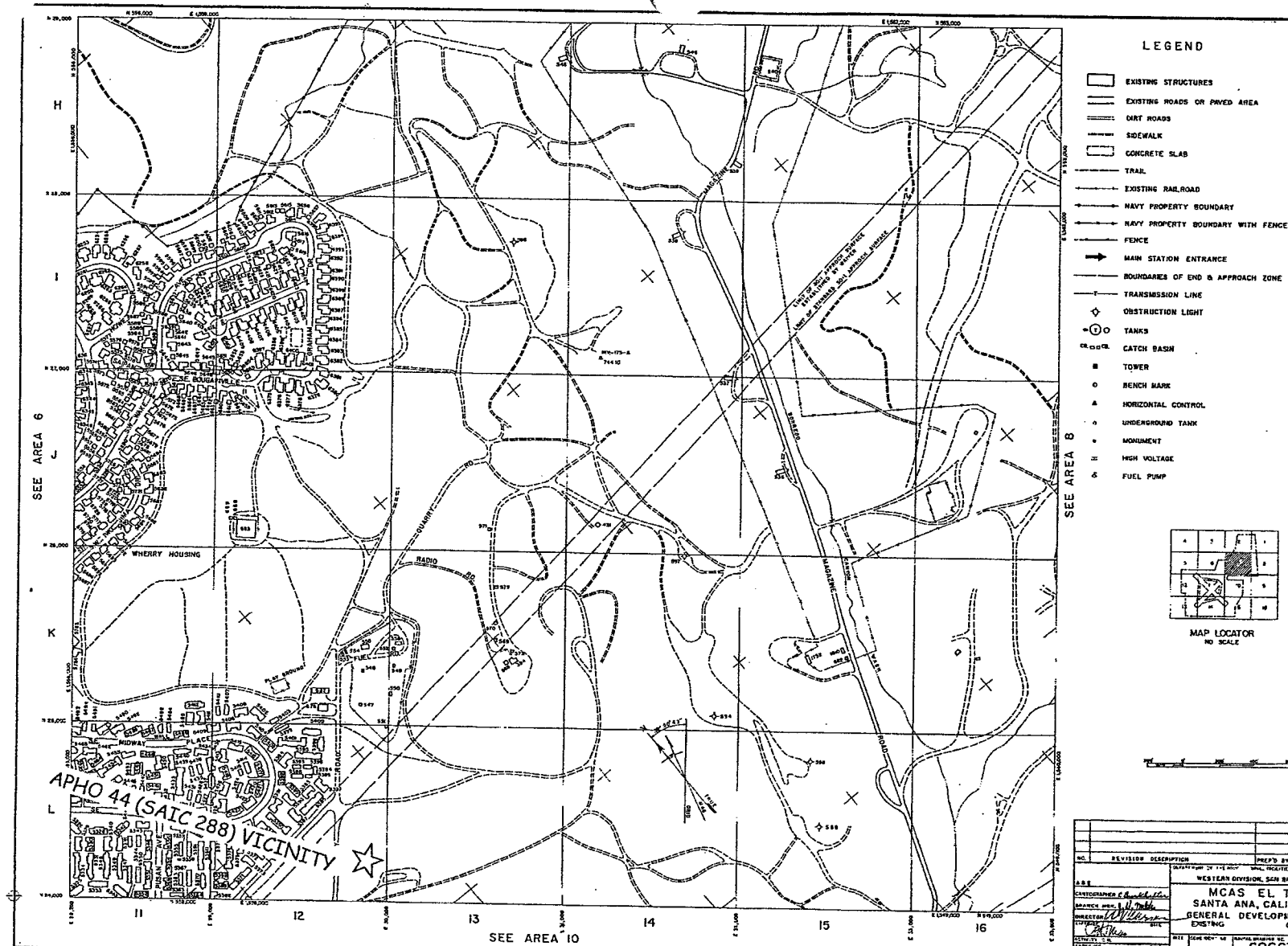


Exhibit 1.

AERIAL PHOTOGRAPH ANOMALY PROGRAM

Tentative Reuse Plan

MARINE CORPS AIR STATION, EL TORO



NO.	REVISION	DESCRIPTION	PREP'D BY	DATE	APPROVED
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Exhibit 4.
AERIAL PHOTOGRAPH ANOMALY PROGRAM
1978 General Development Map
MARINE CORPS AIR STATION, EL TORO

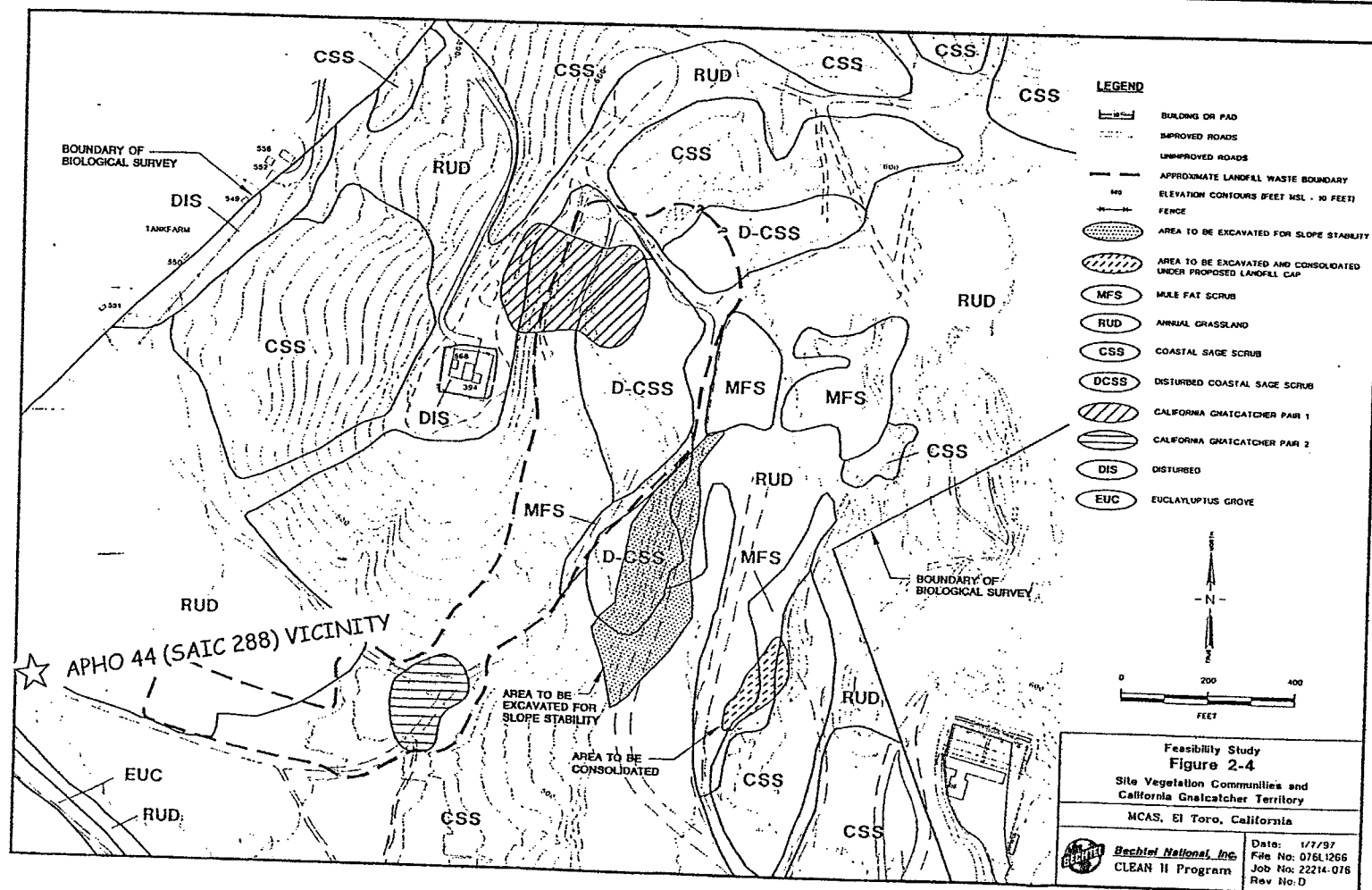


Exhibit 5.
AERIAL PHOTOGRAPH ANOMALY PROGRAM
Natural Resources
MARINE CORPS AIR STATION, EL TORO

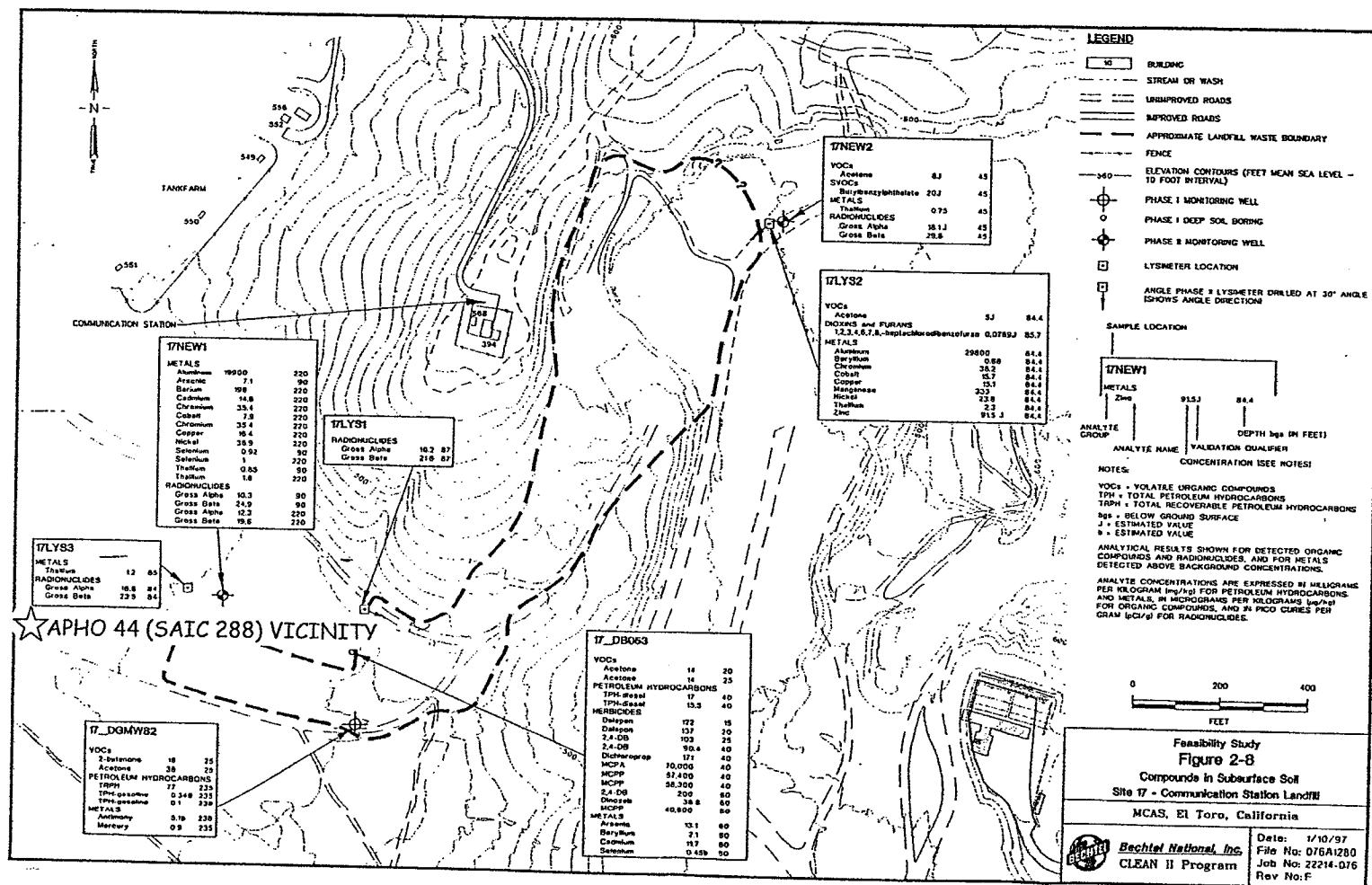


Exhibit 6.

AERIAL PHOTOGRAPH ANOMALY PROGRAM

IRP Site 17 - Soil Sample Locations

MARINE CORPS AIR STATION, EL TORO

EXTRACTS FROM BASE REALIGNMENT AND
CLOSURE CLEANUP PLAN (BCP) AND BRAC
BUSINESS PLAN

SUMMARY REPORT
AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

United States Marine Corps

Base Realignment and Closure Business Plan

EXTRACTS



**For
Marine Corps Air Station
El Toro, CA**

March 2000

**Table 2
Site Summary**

(Sheet 7 of 35)

Database Tracking	Reuse Parcel	Description	Material Disposed	Date of Operation	Status	Regulatory Mechanism	NFA	Comments	ECP Area Type	Approx. ECP Area (acres)
APHO 41	9B	Stains, Wet Soil			NFA	DTSC	X	APHO 41 (SAIC 272 on 1974 photograph) is described as stains or wet soil located southwest of Building 624-the former passenger terminal.	1	0.2
APHO 42	3B	Wet Soil						APHO 42 (SAIC 281 on 1974 photograph) is described as wet soil or a burned area approximately 100 feet east of Building 457.	7	0.2
APHO 43	3B	Excavation						APHO 43 (SAIC 287 on 1974 photograph)	7	0
→ APHO 44	3A	Disturbed Ground, Mounded Material, Trench						APHO 44 (SAIC 288 on 1974 photograph)	7	1.7
APHO 45	2B	Wet Soil, Stain, Liquid, Drums			NFA	DTSC	X	APHO 45 (SAIC 289 on 1974 photograph) was described as wet soils or stains and possible liquid flow to the southwest from the open storage area on the northeast side of Building 415.	1	0
APHO 46	3A	Impoundment, Fill Area, Excavations						APHO 46 (SAIC 416 on 1979 photograph)	7	0.2
APHO 47	2B	Open Storage, Buildings(?), Debris			NFA	DTSC	X	APHO 47 (SAIC 427 on 1980 photograph) was described as an open storage area with storage (?) buildings and possible debris.	1	2.5
APHO 48	2B	Open Storage, Drums			NFA	DTSC	X	APHO 48 (SAIC 431 on 1980 photograph) was described as an open storage area with possible drums adjacent to Building 415.	1	0
APHO 49	8	Wet Soil, Liquid			NFA	DTSC	X	APHO 49 (SAIC 449 on 1981 photograph) is described as probable wet soil or liquid adjacent to the west side of Runway 16R.	1	0
APHO 50	12B	Trench			NFA	DTSC	X	APHO 50 (SAIC 450 on 1981 photograph) is described as a trench or other linear area of disturbed ground south of Tank Farm 5.	1	0
APHO 51	3A	Stain						APHO 51 (SAIC 452 on 1981 photograph)	7	0
APHO 52	9B	Stain			NFA	DTSC	X	APHO 52 (SAIC 482 on 1984 photograph) was described as a stain, approximately 100 feet northeast of Building 240.	1	0
APHO 53	9B	Stains, Drums			NFA	DTSC	X	APHO 53 (SAIC 502 on 1987 photograph) is described as stains and possible drums between Buildings 13 and 14.	1	0.5

Table 3
Site Summary by Reuse Parcel
(Sheet 4 of 35)

Database Tracking	Reuse Parcel	Description	Material Disposed	Date of Operation	Status	Regulatory Mechanism	NFA	Comments	ECP Area Type	Approx. ECP Area (acres)
APHO 31	3A	Disturbed Ground, Trench						APHO 31 (SAIC 215 on 1971 photograph)	7	0
→ APHO 44	3A	Disturbed Ground, Mounded Material, Trench						APHO 44 (SAIC 288 on 1974 photograph)	7	1.7
APHO 46	3A	Impoundment, Fill Area, Excavations						APHO 46 (SAIC 416 on 1979 photograph)	7	0.2
APHO 51	3A	Stain						APHO 51 (SAIC 452 on 1981 photograph)	7	0
APHO 67	3A	SAIC 314 (1975 photograph): Disturbed ground			FA				7	0.5
APHO 68	3A	SAIC 542 (1988 photograph): Light-colored pad, possible concrete			FA				7	0
IRP 5	3A	Perimeter Road Landfill (OU-2C)	Municipal solid waste, unspecified fuels, solvents and cleaning fluids, scrap metals, paint residues, unspecified oily wastes, and low-level radiological materials.	1955 to late 1960s	RI, FS, and PP complete. Draft ROD submitted in 1999. Awaiting results of radiological survey.	FFA		Coincides with INT LF2, formerly identified in interviews.	6	2
MSC D1	3A	Desert Storm supply storage area near DRMO Yard #3	Petroleum products (stored)	Approximately 1991	Inactive				6	0.18
MSC R2	3A	Possible refuse area south of IRP Site 5			Part of IRP Site 5		X	Identified in interviews	1	0.18
RFA 47	3A	< 90-day accumulation area			Not Located During RFA		X		1	0.18
RFA 297	3A	Former asphalt pavement plant					X		1	0.18
TAA 772	3A	< 90-day accumulation area-Bldg. 772			Inactive	DTSC		SWMU/AOC 225	6	0.18
UST 579	3A	320 gal.	Unknown	Inst. 1957	Closed	OCHCA	X		4	0.18
UST 627	3A	size unknown	Diesel (stored)	unknown	Closed	OCHCA	X		4	0.18
APHO 42	3B	Wet Soil						APHO 42 (SAIC 281 on 1974 photograph) is described as wet soil or a burned area approximately 100 feet east of Building 457.	7	0.2
APHO 43	3B	Excavation						APHO 43 (SAIC 287 on 1974 photograph)	7	0
MSC P1	3B	Past pesticide storage area at Bldg. 1687	Pesticides (stored)	Unknown	Inactive				5	0.5
OWS 817	3B	1,500 gal.	Oil/water (stored)	Unknown	Inactive	RWQCB		SWMU/AOC 233	2	0.18
RFA 2	3B	Vegetation Piles					X		1	0.18
RFA 245	3B	Golf course					X		1	0.18
RFA 270	3B	Wash rack					X		2	0.18

United States Marine Corps

EXTRACTS

Base Realignment and Closure Cleanup Plan (BCP)



**For
Marine Corps Air Station
El Toro, CA**

March 1999

Table 3-1a
Site Summary
(Sheet 4 of 34)

Seq No.	Database Tracking	LRA Reuse Parcel	Description	Material Disposed	Date of Operation	Status	Risk to Human Health and the Environment [†]	Regulatory Mechanism	NFA	Comments	ECP Area Type*
55	APHO 31	7	Disturbed ground, mounded material dark-toned, unidentified object							See Table 3-2	7
56	APHO 32	32	Stain							See Table 3-2	7
57	APHO 33	32	Open storage							See Table 3-2	7
58	APHO 34	32	Stain, unidentified object, vertical tank							See Table 3-2	7
59	APHO 35	42	Open storage							See Table 3-2	7
60	APHO 36	42	Wet soil							See Table 3-2	7
61	APHO 37	43	Stain							See Table 3-2	7
62	APHO 38	7	Excavation							See Table 3-2	7
63	APHO 39	23	Wet soil, stain, horizontal tank							See Table 3-2	7
64	APHO 40	32	Drum							See Table 3-2	7
65	APHO 41	32	Stain, wet soil							See Table 3-2	7
66	APHO 42	8	Wet soil							See Table 3-2	7
67	APHO 43	7	Excavation							See Table 3-2	7
→ 68	APHO 44	1	Disturbed ground, mounded material							See Table 3-2	7
69	APHO 45	40	Wet soil, stain, liquid, drum							See Table 3-2	7
70	APHO 46	7	Impoundment, fill area, excavation							See Table 3-2	7
71	APHO 47	40	Open storage, B, debris							See Table 3-2	7
72	APHO 48	40	Open storage, drum							See Table 3-2	7
73	APHO 49	23	Wet soil, liquid							See Table 3-2	7
74	APHO 50	40	Trench							See Table 3-2	7
75	APHO 51	7	Stain							See Table 3-2	7
76	APHO 52	32	Stain							See Table 3-2	7
77	APHO 53	32	Stain							See Table 3-2	7
78	UST 1A	32	500 gal.	Diesel (stored)	Inst. 1943	Closed		RWQCB	X	See Table 3-7	4*
79	UST 1B	32	500 gal.	Diesel (stored)	Inst. 1943	Removed		R/O		See Table 3-7	2
80	UST 6B	32	500 gal.	Fuel oil (stored)	Inst. 1943	Closed		OCHCA	X	See Table 3-7	4*
81	UST 11	32	500 gal.	Diesel (stored)	Inst. 1943	Closed		RWQCB	X	See Table 3-7	4*
82	UST 12	32	500 gal.	Diesel (stored)	Inst. 1943	Closed		RWQCB	X	See Table 3-7	4*
83	UST 13	32	500 gal.	Diesel (stored)	Inst. 1943	Closed		OCHCA	X	See Table 3-7	4*
84	UST 14	32	500 gal.	Diesel (stored)	Inst. 1943	Closed		RWQCB	X	See Table 3-7	4*
85	UST 24	32	500 gal.	Diesel (stored)	Inst. 1943	Closed		RWQCB	X	See Table 3-7	4*
86	UST 32	32	500 gal.	Diesel (stored)	Inst. 1943	Closed		RWQCB	X	See Table 3-7	4*

Table 3-2
Aerial Photograph Features/Anomalies
(Sheet 6 of 7)

Database Tracking	SAIC Anomaly ID No.	LRA Reuse Parcel	Point of Reference	Year	SAIC Observations ¹	SAIC Comments ²	Comments	ECP Area Type
APHO 43	287	7	Golf Course Hole 5	1974	EX	C	Same as anomalies 215 and 161. Unknown excavation.	7
→ APHO 44	288	1	Quarry Rd.	1974	DG, MM	C	Unknown reason for disturbed ground. No HW-generating activities are known to have occurred in this area.	7
APHO 45	289	40	B 415	1974	WS, ST, LQ, D	C	The storage area is located in an unpaved area on the NW side of B 415. Also see anomalies 102 and 431.	7
APHO 46	416	7	Golf Course Hole 5	1979	IM, FA, EX	C	May have been investigated as part of Site 5. Also see anomaly 452	7
APHO 47	427	40	Horse Stables	1980	OS, B, DB	C	Unknown activity. This area is located in the northern most corner of the rodeo area.	7
APHO 48	431	40	B 415	1980	OS, D	C	B 415 is a warehouse used to store miscellaneous. The HWSA associated with this activity (SWMU 125) was investigated and sampled during the RFA. NFA recommended. Also see anomalies 102 and 289.	7
APHO 49	449	23	Runways 34-R & 7-L	1981	WS, LQ	C	Also see anomaly 258.	7
APHO 50	450	40	Tank Farm 5	1981	TR	C	Unknown trench.	7
APHO 51	452	7	B 673	1981	ST	C	Also see anomaly 416	7
APHO 52	482	32	B 240	1984	ST	C	Stain appears to be on unpaved area near SWMU 27. SWMU 27 was sampled during the RFA and NFA recommended. Also see anomaly 206.	7

EXTRACTS FROM THE EBS

SUMMARY REPORT
AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

MARINE CORPS AIR STATION EL TORO
EL TORO, CALIFORNIA
INSTALLATION RESTORATION PROGRAM
FINAL ENVIRONMENTAL
BASELINE SURVEY REPORT

01 April 1995

Revision 0

EXTRACTS

NOTE: ANNOTATIONS MADE BY THE
WRITER OF THE APHO 44 REPORT
ARE IDENTIFIED WITH AN ARROW OR
A STAR SYMBOL: ☆

PREPARED BY:
Southwest Division, Naval Facilities
Engineering Command
1220 Pacific Highway
San Diego, California 92132-5190

THROUGH:
CONTRACT #N68711-89-D-9296
CTO #284
DOCUMENT CONTROL NO:
CLE-C01-01F284-S2-0004

WITH:
Jacobs Engineering Group, Inc.
401 West A Street, Suite 1905
San Diego, California 92101

In association with:
International Technology Corporation
CH2M HILL

E AREA

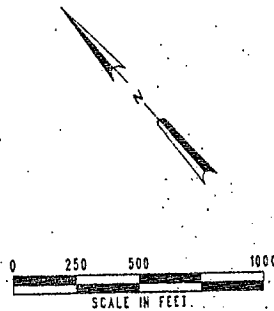
EXTRACTS

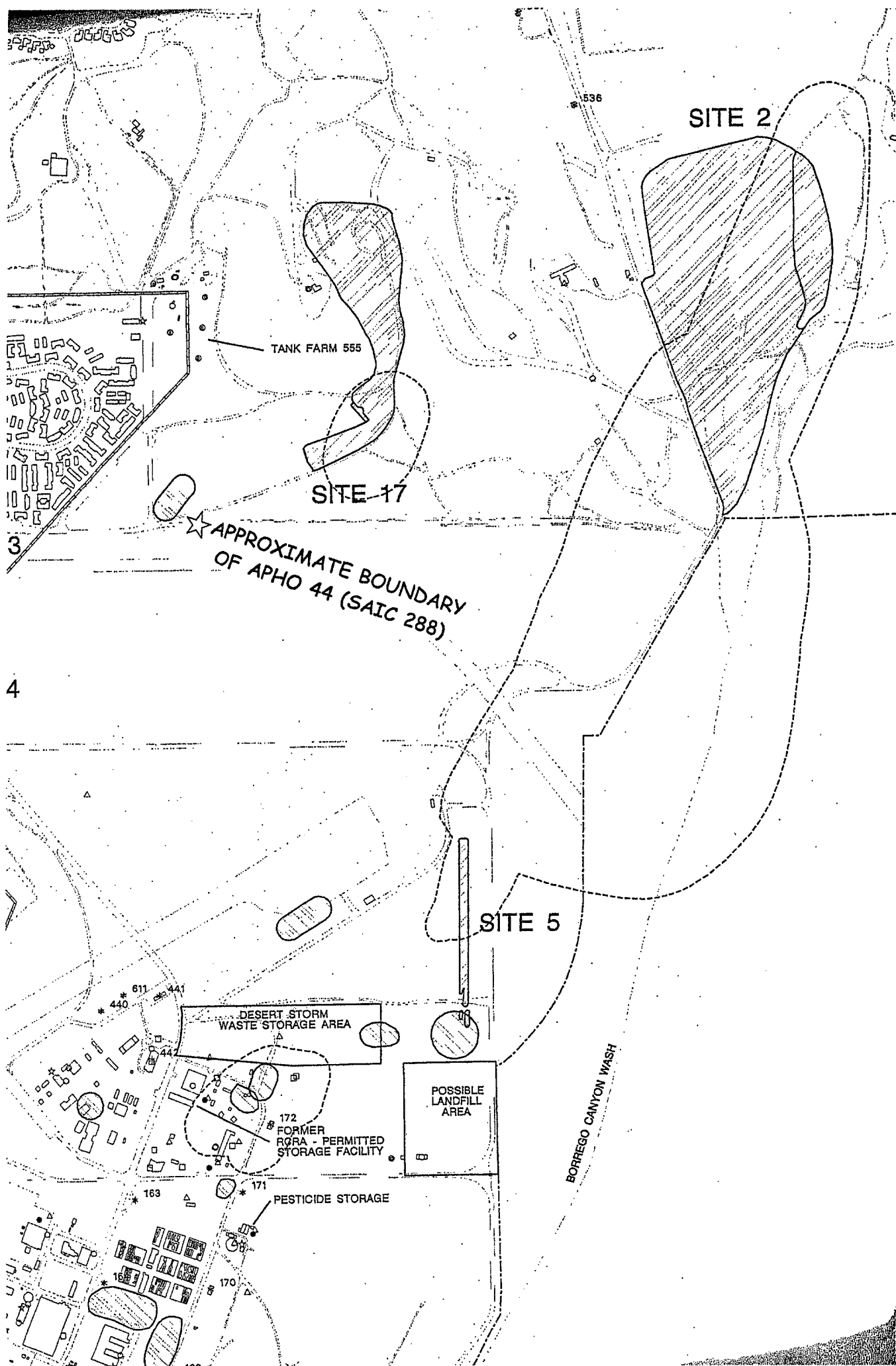
**FIGURE 3-1
LOCATIONS OF LO**

MCAS EL TORO EBS
01 April 95

E AREA

Pesticide Storage Area





EXTRACTS FROM SAIC STUDY

SUMMARY REPORT
AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

Final Report
Aerial Photograph Assessment
MCAS El Toro
Contract No. N68711-91-D-4658
Delivery Order 0002
SAIC Project No. 01-0892-02-0817

EXTRACTS

NOTE: ANNOTATIONS MADE BY THE
WRITER OF THE APHO 44 REPORT
ARE IDENTIFIED WITH AN ARROW OR
A STAR SYMBOL: ☆

Submitted to:

Naval Facilities Engineering Command
Southwest Division
1220 Pacific Highway, Room 18
San Diego, CA 92132-5181

Submitted by:

Science Applications International Corporation
Engineering Sciences Division
10260 Campus Point Drive, MS F1
San Diego, CA 92121

October 25, 1993

contaminants would be used and probably stored at the facility. No additional investigation is recommended unless contamination is detected at the site, or downgradient of the site, in areas of interest to the IR program.

c 287. There is an excavation (EX) about 1600 feet west of the Perimeter Road and Magazine Road intersection. The purpose of the excavation is unknown, and investigation of the site history as a possible disposal area is recommended.

→ c 288. Disturbed ground (DG), mounded material (MM) and probable trench (TR) can be seen about 700 feet southeast of the Perimeter Road and Quarry Road intersection. The purpose of the features is unknown, and investigation of site history as a possible disposal area is recommended.

c 289. There are wet soil (WS) or a stain (ST), and possible liquid (LQ) flow to the southwest from the open storage area on the northeast side of Building 415, adjacent to the Rodeo Area. Drums (D) may also be present. Additional investigation is recommended.

c 290. No significant changes are noted at the South Coast Agriculture Field Station.

c 291. No significant changes are noted at this apparent industrial or agricultural site.

a 292. At the Magazine Road Landfill, the trenches (TR) remain open and there are unidentified objects (UO) probably containers, but there are no significant changes.

c 293. There is wet soil (WS) and probable liquid (LQ) in the open area north of Trabuco Road, about 700 feet northwest of Gate No. 1. The features probably due to irrigation. Additional investigation is not recommended at this time.

a 571. No significant changes are noted at the EOD Range. The site is not indicated on the photograph.

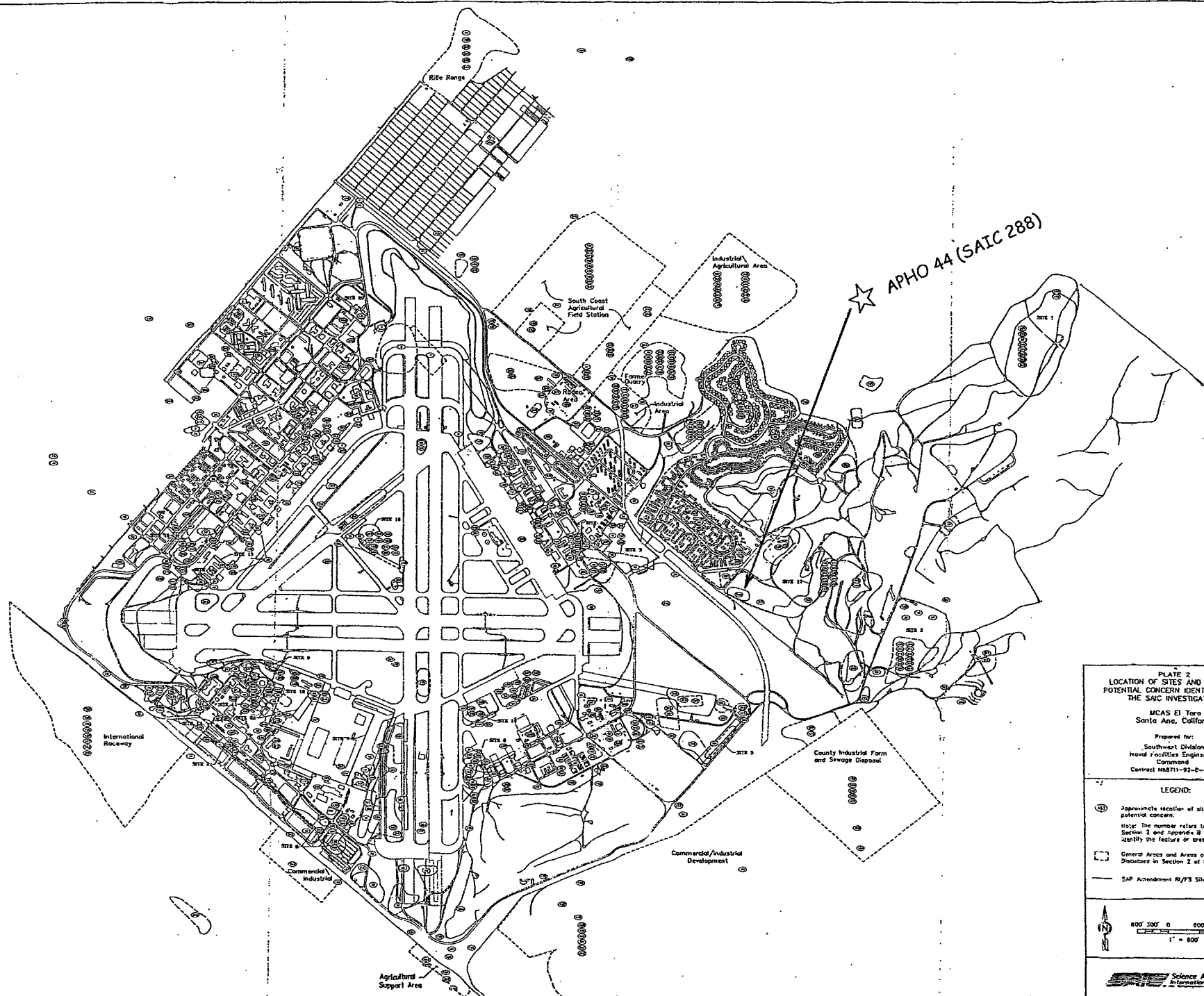


PLATE 2
LOCATION OF SITES AND AREAS OF
POTENTIAL CONCERN IDENTIFIED DURING
THE SAIC INVESTIGATION

MCAS El Toro
Santa Ana, California

Prepared for:
Southwest Division
Naval Facilities Engineering
Command
Contract N68711-92-D-4858

LEGEND:

(15) Approximate location of site or area of potential concern.
Note: The number refers to comments in Section 2 and Appendix B their status or identify the feature or area of concern.

[] General Areas and Areas of Potential Concern Discussed in Section 2 of this Report

— SAP Attachment 19/FS Sites

800' 300' 0 300' 1200'
1" = 800'

Science Applications
International Corporation

EXTRACTS FROM SWPPP

SUMMARY REPORT
AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

**STORM WATER POLLUTION PREVENTION PLAN
(SWPPP)**

FOR

**MARINE CORPS AIR STATION EL TORO
EL TORO, CALIFORNIA.**

EXTRACTS

CONTRACT NO. N68744-96-D-2059
DELIVERY ORDER NO. 0002

VOLUME 1

NOTE: ANNOTATIONS MADE BY THE
WRITER OF THE APHO 44 REPORT
ARE IDENTIFIED WITH AN ARROW OR
A STAR SYMBOL: ☆

JULY, 1997

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

5.31 DRAINAGE BASIN 31

This drainage basin comprises some of the buildings in Areas 2, 3 and 4. It has an area of about 119 acres. This area is residential, and no industrial activities subject to storm water permitting were observed in this area.

5.32 DRAINAGE BASIN 32

This drainage basin comprises some of the buildings in Areas 8, 9 and 14. This area is residential and agricultural. For agricultural operations a non-point source survey and monitoring program is recommended to assess potential contributions of pollutants in storm water run-off.

5.32.1 Buildings of Limited Concern

The following buildings do not use, handle, transport or store significant quantities of industrial materials nor does it generate significant amounts of liquid or solid pollutants and does not appear to be of concern to the quality of storm water discharges:

TABLE 5-33 BASIN 32 BUILDINGS OF LIMITED CONCERN		
BLDG #	DESCRIPTION	TENANT
394	Transmitter (UHF/VHF/COMMxMTR)	Station/G-6
568*	Standby Generator Building	Installation
573	Antenna, Communications	Station/G-6
582*	Maintenance Building/Housing	Housing
583	Storage Tank/Potable Water	Installation
678	Housing/Maintenance Storage	Housing
688	Receiver Building	Vacant

TABLE 5-33		
BASIN 32		
BUILDINGS OF LIMITED CONCERN		
BLDG #	DESCRIPTION	TENANT
5301- 5762	Family Housing	Housing

- * Buildings with an asterisk indicate facilities which were not involved in any industrial activities or did not store any hazardous materials at the time of our field observations. However, these facilities appear to have been involved in activities of potential concern in the past. If activities of concern resume in the future, site specific BMPs should be adopted. These facilities/activities should be observed on an annual basis in order to update this plan as necessary.

5.32.2 Buildings of Concern

The following buildings or facilities use or otherwise deal with industrial materials and therefore are considered to be of concern as potential sources of pollution to the storm water system. In some cases, this potential is limited; however, best management practices are suggested in all instances where the potential was noted.

Tank Farm 555 (547-552, 555, 556) - Supply

This facility consists of a JP-5 fuel tank farm, and associated pipeline and maintenance buildings. The tank farm is resupplied from a pipeline connected to a refinery/depot located off MCAS El Toro. Underground fuel storage tanks 547, 548, 549, 550, and 551 each have a capacity of approximately 550000 gallons. Building 552 consists of a POL testing laboratory, Building 555 is the fuel farm office/pipeline control station, and Building 556 is a maintenance/storage building. The fuel farm directly supplies additional tanks on MCAS El Toro by pipeline, however, occasional de-fueling of aircraft fuel trucks occurs at the facility. Truck de-fueling operations are performed within concrete steeply bermed areas. These bermed areas drain to an underground recovery tank.

Spill kits and a SPCCP are present at the facility and personnel are trained in spill response techniques. No additional BMPs are recommended at this time.

recovery tank.

Spill kits and a SPCCP are present at the facility and personnel are trained in spill response techniques. No additional BMPs are recommended at this time.

5.32.3 Summary of Potential Pollutants

The following pollutants pose a potential threat to storm water quality in Drainage Basin 32:

JP-5 fuel

5.32.4 Summary of Best Management Practices

The following BMPs are general management practices for the control or prevention of storm water pollution associated with activities at MCAS El Toro. These BMPs have been formulated based on the existing conditions at the various buildings and facilities throughout MCAS El Toro, as described above. Table 5-34 lists the existing and recommended BMPs for each building located within the drainage basin.

TABLE 5-34
BASIN 32
SUMMARY OF BMPs

BLDG #	BASIN	BUILDING DESCRIPTION	TENANT	Concern Level	BMP STATUS	BMP #	BMP Description
5301-5762	32	Family Housing	Housing	Limited			No Additional BMPs Recommended
394	32	Transmitter (UHF /VHF/COMM x MTR)	Station/G-6	Limited			No Additional BMPs Recommended
547	32	ACFT Ready Fuel Storage Tank Farm #555	Supply	Concern	Existing	009	Personnel Training
					Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area
548	32	ACFT Ready Fuel Storage Tank Farm #555	Supply	Concern	Existing	009	Personnel Training
					Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area
549	32	ACFT Ready Fuel Storage Tank Farm #555	Supply	Concern	Existing	009	Personnel Training
					Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area

TABLE 5-34

BASIN 32

SUMMARY OF BMPs

BLDG #	BASIN	BUILDING DESCRIPTION	TENANT	Concern Level	BMP STATUS	BMP #	BMP Description
550	32	ACFT Ready Fuel Storage Tank Farm #555	Supply	Concern	Existing	009	Personnel Training
					Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area
551	32	ACFT Ready Fuel Storage Tank Farm #555	Supply	Concern	Existing	009	Personnel Training
					Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area
552	32	Misc. POL Pipeline Facility Tank Farm #555	Supply	Concern	Existing	009	Personnel Training
					Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area
555	32	POL Sampling/Testing Building Tank Farm	Supply	Concern	Existing	009	Personnel Training

TABLE 5-34
BASIN 32
SUMMARY OF BMPs

BLDG #	BASIN	BUILDING DESCRIPTION	TENANT	Concern Level	BMP STATUS	BMP #	BMP Description
		#555			Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area
556	32	Misc. POL Pipeline Facility Tank Farm #555	Supply	Concern	Existing	009	Personnel Training
					Existing	112	Prepare Appropriate Spill Prevention and Response Plans
					Existing	012	Construct Berm or Dike Around Critical Areas
					Existing	023	Place Portable Rubber Mats over Storm Drain Inlets
					Existing	065	Place Spill Kit in Area
568	32	Standby Generator Building	Installation	Previous			No Additional BMPs Recommended
573	32	Antenna, Communications	Station/G-6	Limited			No Additional BMPs Recommended
582	32	Maintenance Building/Housing	Housing	Previous			No Additional BMPs Recommended
583	32	Storage Tank/Potable Water	Installation	Limited			No Additional BMPs Recommended
678	32	Housing/Maintenance Storage	Housing	Limited			No Additional BMPs Recommended
688	32	Receiver Building	Vacant	Limited			No Additional BMPs Recommended

TABLE 5-34

BASIN 32

SUMMARY OF BMPs

BLDG #	BASIN	BUILDING DESCRIPTION	TENANT	Concern Level	BMP STATUS	BMP #	BMP Description
689	32	Receiver/ Activity TV Antenna	Installation	Limited			No Additional BMPs Recommended
722	32	General Store/Self- Help/Thrift Shop	MWR-Ret	Limited			No Additional BMPs Recommended

EXTRACTS FROM HM/HWMP

SUMMARY REPORT
AERIAL PHOTOGRAPH ANOMALY 44

DATED 3 NOVEMBER 2000

Final

Marine Corps Air Station El Toro
Hazardous Material/Hazardous Waste
Management Plan

August 1994

EXTRACTS

NOTE: ANNOTATIONS MADE BY THE
WRITER OF THE APHO 44 REPORT
ARE IDENTIFIED WITH AN ARROW OR
A STAR SYMBOL: ☆



Prepared for:

Southwest Division Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, CA 92132-5190

Prepared by:

Science Applications International Corporation
Engineering Sciences Division
10260 Campus Point Drive
San Diego, CA 92121

Contract No. N68711-92-D-4658
Delivery Order No. 0004



HAZARDOUS MATERIALS STORAGE.



HAZARDOUS WASTE ACCUMULATION POINT



ONE YEAR PERMITTED HAZARDOUS WASTE
STORAGE AREA

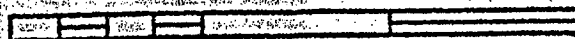
MCAS El Toro
Santa Ana, California

HAZARDOUS WASTE ACCUMULATION POINTS AND HAZARDOUS MATERIAL STORAGE LOCATIONS

NOVEMBER 5, 1993



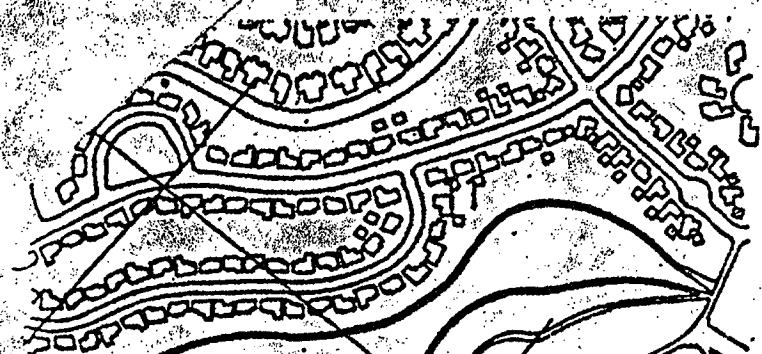
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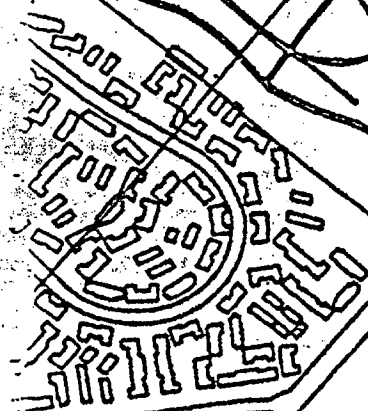


Science Applications
International Corporation
An Employee-Owned Company



12

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★ APHO 44 (SAIC 288) VICINITY

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No Further Action Decision Documents for Nearby Environmental
Locations of Concern (LOCs)
And
Selected Groundwater Information



**COUNTY OF ORANGE
HEALTH CARE AGENCY**

**REGULATORY HEALTH SERVICES
ENVIRONMENTAL HEALTH**

**JULIETTE A. POULSON, RN, MN
INTERIM DIRECTOR**

**MIKE SPURGEON
DEPUTY AGENCY DIRECTOR
REGULATORY HEALTH SERVICES**

**JACK MILLER, REHS
DIRECTOR
ENVIRONMENTAL HEALTH**

**MAILING ADDRESS:
2009 EAST EDINGER AVENUE
SANTA ANA, CA 92705-4720**

**TELEPHONE: (714) 667-3600
FAX: (714) 972-0749**

E-MAIL: environhealth@hca.co.orange.ca.us

August 31, 2000

Mr. Dean Gould
Base Realignment and Closure
Environmental Coordinator
Naval Facilities Engineering Command
Southwest Division-Code 5MBE.LMH
1220 Pacific Highway
San Diego, CA 92132-5190

Subject: Completion of Tank Removal Project

RE: Marine Corps Air Station El Toro
Tank #T-1
Santa Ana, CA 92709

Dear Mr. Gould:

This is a response to your request for a confirmation of the completion of the tank removal project. With the provision that the results for the soil samples obtained during the tank removal on June 6, 2000 were accurate and representative of existing conditions, it is the position of this office that no significant soil contamination has occurred at the above noted facility location.

It should be pointed out that this letter does not relieve you of any responsibilities mandated under the California Health and Safety Code if additional or previously unidentified contamination is discovered at the subject site.

If you any questions regarding this matter, please contact Arghavan Rashidi-Fard at (714) 667-3713.

Sincerely,

William J. Diekmann, M.S., REHS
Supervising Hazardous Waste Specialist
Hazardous Materials Management Section
Environmental Health

cc: Lynn Hornecker, SWDIV



**COUNTY OF ORANGE
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SANTA ANA, CA 92705-4720**

**TELEPHONE: (714) 667-3600
FAX: (714) 972-0749**

E-MAIL: environhealth@hca.co.orange.ca.us

July 25, 2000

Mr. Dean Gould
Base Realignment and Closure
Environmental Coordinator
Naval Facilities Engineering Command
Southwest Division-Code 5MBE.LMH
1220 Pacific Highway
San Diego, CA 92132-5190

Subject: Completion of Tank Removal Project

RE: Marine Corps Air Station El Toro
Tank #568
Santa Ana, CA 92709

Dear Mr. Gould:

This is a response to your request for a confirmation of the completion of the tank removal project. With the provision that the results for the soil samples obtained during the tank removal on March 8, 2000 were accurate and representative of existing conditions, it is the position of this office that no significant soil contamination has occurred at the above noted facility location.

It should be pointed out that this letter does not relieve you of any responsibilities mandated under the California Health and Safety Code if additional or previously unidentified contamination is discovered at the subject site.

If you any questions regarding this matter, please contact Arghavan Rashidi-Fard at (714) 667-3713.

Sincerely,

William J. Diekmann, M.S., REHS
Supervising Hazardous Waste Specialist
Hazardous Materials Management Section
Environmental Health

cc: Lynn Hornecker, SWDIV

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SANTA ANA REGION

3737 MAIN STREET, SUITE 500

RIVERSIDE, CA 92501-3339

PHONE: (909) 782-4130

FAX: (909) 781-6288



November 19, 1997

Mr. Wayne D. Lee
Assistant Chief of Staff
Environmental and Safety
Marine Corps Air Station El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001

**CASE CLOSURES FORMER UNDERGROUND STORAGE TANK SITES (UST's) 553
AND 554 MARINE CORPS AIR STATION EL TORO**

Dear Mr. Lee:

This letter confirms the completion of site investigations and remedial actions for the subject underground storage tank sites. Based on the information provided in the Summary Report, Former UST Sites 553 and 554 dated 10/24/97 and with the provision that the information provided to this agency was accurate and representative of site conditions, no further action related to the underground storage tank releases is required.

This notice is issued pursuant to a regulation contained in Title 23, Division 3, Chapter 16, Section 2721(e) of the California Code of Regulations.

If you have any questions, regarding this matter, please contact Lawrence Vitale at (909) 782-4998.

Sincerely,

Gerard J. Thibeault
Gerard J. Thibeault
Executive Officer

cc: LT Hope Katcharian, Marine Corps Air Station El Toro
Mr. Bill Diekman, Orange County Health Care Agency
Mr. John Adams Jr., State Water Resources Control Board, Division of Clean
Water Programs

FINAL

GROUNDWATER MONITORING REPORT
OCTOBER 1997 SAMPLING ROUND

EXTRACTS

GROUNDWATER MONITORING PROGRAM
FOR
MARINE CORPS AIR STATION EL TORO
EL TORO, CALIFORNIA

Contract No. N68711-96-D-2029
Delivery Order 005

Prepared for:

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 Pacific Highway
San Diego, California 92132

Prepared by:

CDM FEDERAL PROGRAMS CORPORATION
3760 Convoy Street, Suite 210
San Diego, California 92111

March 1998

Table B-1: WATER LEVEL MEASUREMENTS AND GROUNDWATER ELEVATIONS
MCAS El Toro Groundwater Monitoring Program

STATION ID	WELL TYPE	SCREEN INTERVAL (feet BGS)	TOP OF CASING ELEVATION (feet MSL)	MEASUREMENT DATE	DEPTH TO WATER (feet TOC)	WATER LEVEL ELEVATION (feet MSL)	CHANGE FROM PRIOR ELEVATION (+ or - feet)
17 DGMWB2	WT	235 - 255	442.12	12-Jan-96	189.55	252.57	
			442.12	9-Feb-96	192.04	250.08	-2.49
			442.12	28-Feb-96	192.04	250.08	0.00
			442.12	31-Oct-96	185.60	256.52	6.44
			442.12	26-Nov-96	185.50	256.62	0.10
			442.12	26-Dec-96	185.22	256.90	0.28
			442.12	24-Jan-97	184.43	257.69	0.79
			442.12	12-Aug-97	183.64	258.48	0.79
17NEW1	WT	186 - 226	431.93	31-Oct-96	183.88	248.05	
			431.93	26-Nov-96	183.60	248.33	0.28
			431.93	26-Dec-96	183.22	248.71	0.38
			431.93	24-Jan-97	183.75	248.18	-0.53
			431.93	27-Feb-97	181.98	249.95	1.77
			431.93	27-Mar-97	182.10	249.83	-0.12
			431.93	27-Jun-97	181.90	250.03	0.20
			431.93	12-Aug-97	181.04	250.89	0.86
			431.93	24-Sep-97	180.05	251.88	0.99
			431.93	6-Nov-97	184.02	247.91	-3.97
17NEW2	WT	83 - 123	551.36	31-Oct-96	87.95	463.41	
			551.36	26-Nov-96	88.01	463.35	-0.06
			551.36	26-Dec-96	87.88	463.48	0.13
			551.36	24-Jan-97	88.56	462.80	-0.68
			551.36	27-Feb-97	87.53	463.83	1.03
			551.36	27-Mar-97	87.72	463.64	-0.19
			551.36	12-Aug-97	88.00	463.36	-0.28
			551.36	24-Sep-97	87.50	463.86	0.50
			551.36	6-Nov-97	87.66	463.70	-0.16
18 BGMP06A	MP	445 - 455	175.41	7-Feb-96	NA	127.57	
			175.41	27-Feb-96	NA	128.48	0.91
			175.41	27-Mar-96	NA	128.56	0.08
			175.41	1-Nov-96	NA	99.35	-29.21
			175.41	26-Nov-96	NA	114.41	15.06
			175.41	26-Dec-96	NA	121.94	7.53
			175.41	23-Jan-97	NA	127.68	5.74
			175.41	27-Feb-97	NA	127.99	0.31
			175.41	27-Mar-97	NA	113.15	-14.84
			175.41	26-Jun-97	NA	101.41	-11.74
			175.41	12-Aug-97	NA	100.24	-1.17
			175.41	24-Sep-97	NA	97.90	-2.34
			175.41	5-Nov-97	NA	112.73	14.83
18 BGMP06B	MP	380 - 390	175.41	7-Feb-96	NA	108.99	
			175.41	27-Feb-96	NA	110.95	1.96
			175.41	27-Mar-96	NA	109.09	-1.86
			175.41	1-Nov-96	NA	69.58	-39.51
			175.41	26-Nov-96	NA	91.16	21.58
			175.41	26-Dec-96	NA	100.96	9.80
			175.41	23-Jan-97	NA	109.61	8.65
			175.41	27-Feb-97	NA	107.99	-1.62
			175.41	27-Mar-97	NA	87.57	-20.42
			175.41	26-Jun-97	NA	71.02	-16.55
			175.41	12-Aug-97	NA	69.45	-1.57
			175.41	24-Sep-97	NA	66.48	-2.97
			175.41	5-Nov-97	NA	84.19	17.71

Table 4-1: SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS
MCAS El Toro Groundwater Monitoring Program

Station ID	Base Screen Depth (F1 BGS)	Sample Date	PRIMARY VOCs DETECTED AND REGULATORY STANDARDS - All Results in Micrograms per Liter (ug/L)												OTHER VOCs DETECTED	
			TCE 5.0	PCE 5.0	CCl ₄ 0.5	1,1-DCE 6.0	1,2-DCE (total)	Chloroform 100.0	Chloro- methane	Benzene 1.0	Toluene 100.0	Ethyl- benzene 680.0	Xylenes (total) 1750.0	Freon-113	Compound	Concent
16_UGMW33	220	17-Dec-92	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.4 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U		METHYLENE CHLORIDE	0.5 U
		14-Jul-93	0.8 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U			
		7-Feb-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		25-Nov-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		19-Mar-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		10-Jul-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
17_DGMW82	255	22-Oct-97	0.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		6-Mar-93	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U		METHYLENE CHLORIDE	0.9 U
		2-Aug-93	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	7.0	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U		METHYLENE CHLORIDE	1.0 U
		6-Dec-95	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.9 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		9-Feb-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.8 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		20-Nov-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.8 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
17NEW1	226	1-Apr-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		12-Jan-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		20-Nov-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		24-Mar-97	0.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		30-Jun-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		23-Oct-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	7.0	10.0 U	ETHYLBENZENE	1.0
17NEW2	123	23-Oct-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		3-Jan-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		20-Nov-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		24-Mar-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		30-Jun-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		23-Oct-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
18_BGMP06A	455	23-Oct-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	METHYLENE CHLORIDE	0.4 U
		10-Aug-92	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.9 U	1.0 U	1.0 U	1.0 U	1.0 U			
		14-Aug-92	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U			
		8-Dec-93	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U		CARBON DISULFIDE	2.0
		7-Feb-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U			
		8-Nov-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
18_BGMP06B	390	10-Mar-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		10-Jul-92	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	20.0	1.0 U	1.0 U	1.0 U	1.0 U			
		13-Aug-92	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U			
		8-Nov-93	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0	1.0 U	1.0 U	1.0 U	1.0 U			
		7-Feb-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U			
		8-Nov-96	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
		10-Mar-97	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		
			1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.0 U		

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Room 135
San Diego, California 92132-5187

Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL
ACTION NAVY
CLEAN II**

EXTRACTS

**DRAFT FINAL PHASE II
REMEDIAL INVESTIGATION REPORT
OPERABLE UNIT 2B - SITE 17
MARINE CORPS AIR STATION
EL TORO, CALIFORNIA
Volume III of V, Appendices F-O**

CTO-0076/0552

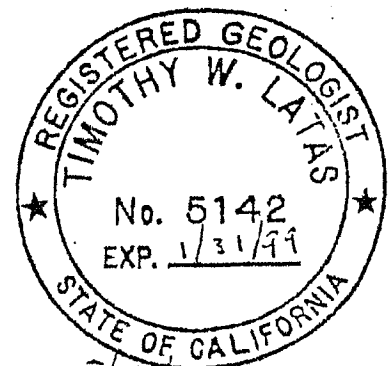
April 1997

RECEIVED

US FWS
CARLSBAD FIELD OFFICE, CA

Prepared by:

BECHTEL NATIONAL, INC.
401 West A Street, Suite 1000
San Diego, California 92101



Signature: _____

Timothy W. Latas
Timothy W. Latas, R.G., CTO Leader

Date: 5/15/97



BOREHOLE LOG

PROJECT and JOB NUMBER

CLEAN II

22214-076

HOLE NO.

17NEW1

SHEET NO. 1 OF 6

DRILLING COMPANY

Layne Environmental Services

SITE and LOCATION

Site 17 - Communication Sta. Landfill, MCAS El Toro

OVERBURDEN BEGUN

233.0

11-1-9:

DRILL MAKE AND MODEL

AP 1000

COORDINATES

N 2,191,653.03 E 6,118,812.31

LOGGED BY:

Sheila Soderberg

ROCK (FT)

0.0

COMPLETED

11-8-95

HOLE DIAMETER and/or CORE HOLE DIAMETER

11"

na

GROUND EL. & DEPTH/EL. GROUND WATER

431.31

205.0/226.3
191.5/239.8

CHECKED BY:

T. W. Latas

TOTAL DEPTH

233.0

UPDATE

3-4-96

Organic Vapor Reading (ppm)	Radiologic Reading (cpm)	Core/Soil Recovery (%)	Core Length/ Sampler Advance	Blow Counts or Recovery (ft)	Sampler Type/ BEIDMS No.	Elevation in Feet	Depth in Feet	Graphics	Sample/recovery	Description and Classification	Remarks:
0 0	40	100	1.5	5 10 7	SS *	431.3				SANDY SILT (ML): Dark brown [10YR 4/3], medium stiff, dry, ~20% fine grained sand, with rootlets, trace gravel.	Hole hand augered to 5.0 ft; then drilled to depth by dual-tube percussion method.
0 0	40	100	1.5	9 9 7	SS [76Q0098]	428.3	5			SAND (SW): Light yellowish brown [10YR 6/4], loose, dry, fine to medium grained, trace fines and gravel.	Cuttings and soil samples monitored with photo (PID) and flame (FID) ionization detector and a Geiger-Mueller detector.
0 0	40	100	1.5	2 5 11	SS [76Q0090]		10			at 10.0 ft: color change to Strong brown [7.5YR 5/6], trace fines.	Background radiological readings = 35-50 counts per minute (cpm).
0 0	60	67	1.5	3 5 5	SS [76Q0091]	417.3	15			SILT (ML): Dark brown [7.5YR 4/4], medium stiff, dry, trace fine grained sand.	Soil samples collected with 3-inch OD split-spoon sampler with 6-inch stainless-steel tubes.
0 0	40	100	1.5	5 7 11	SS 76Q0008		20			at 20.0 ft: trace gravel.	Sampler driven with 140 lbs hammer with 30-inch drop.
0 0	40	100	1.5	10 10 9	SS [76Q0099]		25			at 25.0 ft: color change to Brown [10YR 5/3].	* No tubes in first sampler, no sample collected.
0 0	40	100	1.5	10 10 11	SS [76Q0092]		30				Description and classification by visual examination of samples and cuttings.
						396.3					Colors from "Munsell Soil-Color Charts" [1988]

SS = SPLIT SPOON SAMPLER;
HP = HYDRO-PUNCH SAMPLER

SITE and LOCATION

Site 17 - Communication Sta. Landfill, MCAS El Toro

HOLE NO.

17NEW1



BOREHOLE LOG

PROJECT and JOB NUMBER

CLEAN II

22214-076

HOLE NO.

17NEW1

SHEET NO. 2 OF 6

Organic Vapor Reading (ppm)	Radiologic Reading (cpm)	Core/Soil Recovery (%)	Core Length/ Sampler Advance	Blow Counts or Recovery (ft)	Sampler Type/ BEIDMS No.	Elevation in Feet	Depth in Feet	Graphics Sample/Recovery	Description and Classification	Remarks:
0/0	40	100	1.5	4 6 3	SS [76Q0093]	393.3			SANDY SILT (ML): Yellowish brown [10YR 5/4], medium stiff, dry, ~20-25% fine grained sand.	
0/0	50	100	1.5	4 7 8	SS [76Q0100]	390.3	40		SAND (SW): Light yellowish brown [10YR 6/4], loose to medium dense, moist, fine to medium grained, with ~25-30% coarse grains, trace fines.	
0/0	20	100	1.5	4 4 6	SS [76Q0101]		45		SANDY CLAY (CL): Dark brown [10YR 3/3], soft to medium stiff, moist, ~30-35% fine grained sand, medium plasticity.	
0/0	20	100	1.5	4 7 8	SS [76Q0094]		50			
0/0	35	100	1.5	4 8 8	SS [76Q0102]		55		at 55.0 ft: color change to Very dark grayish brown [10YR 3/2], low plasticity.	
0/0	30	100	1.5	3 6 11	SS [76Q0103]		60		at 61.0 ft: color change to Dark brown [10YR 3/3], medium stiff, moist, ~30-35% fine to coarse grained sand, with ~20-25% gravel.	
0/0	40	100	1.5	3 6 14	SS [76Q0104]	368.8	65		SANDY SILT (ML): Dark brown [10YR 3/3], medium stiff, dry to moist, ~25-30% fine grained sand.	
0/0	60	100	1.5	7 9 15	SS [76Q0105]		70			

SS = SPLIT SPOON SAMPLER;
HP = HYDRO-PUNCH SAMPLER

SITE and LOCATION

Site 17 - Communication Sta. Landfill, MCAS El Toro

HOLE NO.

17NEW1



BOREHOLE LOG

PROJECT and JOB NUMBER

CLEAN II

22214-076

HOLE NO.

17NEW1

SHEET NO. 3 OF 6

Organic Val. Reading (ppm)	Radiologic Reading (cpm)	Core/Soil Recovery (%)	Core Length/ Sampler Advance	Blow Counts or Recovery (ft)	Sampler Type/ BEIDMS No.	Elevation in Feet	Depth in Feet	Graphics Sample/recovery	Description and Classification	Remarks:
0/0	20	100	1.5	14 19 21	SS [76Q0106]	353.3			at 75.0 ft: color change to Brown [7.5YR 5/4], trace gravel.	
0/0	20	100	1.5	15 23 25	SS [76Q0107]		80		SILTY SAND (SM): Brown [7.5YR 5/4], dense, moist, ~60-65% fine grained sand.	
0/0	20	100	1.5	19 23 36	SS [76Q0108]		85			
0/0	80	100	1.5	30 30 29	SS 76Q0009		90		at 90.0 ft: color change to Yellowish brown [10YR 5/4], with clay, ~45-50% fine grained sand, 40-35% silt, ~10-15% clay.	
0/0	40	100	1.5	10 21 24	SS [76Q0109]		95		at 95.0 ft: ~60-65% fine grained sand, ~35-40% silt, trace clay.	
0/0	40	100	1.5	20 34 33	SS [76Q0084]		100		at 100.0 ft: color change to Yellowish brown [10YR 5/6], ~70-75% fine grained sand, ~25-30% silt, trace angular to subangular gravel up to 0.5".	
0/0	55	100	1.5	11 25 35	SS [76Q0088]	326.3	105		SANDY SILT (ML): Dark yellowish brown [10YR 4/4], very stiff to hard, dry to moist, ~35-40% fine grained sand.	
0/0	40	100	1.5	20 28 29	SS [76Q0086]		110		at 110.0 ft: color change to Strong brown [7.5YR 5/6], ~30-35% fine grained sand, trace clay.	

SS = SPLIT SPOON SAMPLER;
HP = HYDRO-PUNCH SAMPLER

SITE and LOCATION

Site 17 - Communication Sta. Landfill, MCAS El Toro

HOLE NO.

17NEW1

Template: NAVYS, 11093

Project ID: ELD76, 31



BOREHOLE LOG

PROJECT and JOB NUMBER

CLEAN II

22214-076

HOLE NO.

17NEW1

SHEET NO. 4 OF 6

Organic Vapor PID Reading (ppm)	Radiologic Reading (cpm)	Core/Soil Recovery (%)	Core Length/ Sampler Advance	Blow Counts or Recovery (ft)	Sampler Type/ BEIDMS No.	Elevation in Feet	Depth in Feet	Graphics	Sample/Recovery	Description and Classification	Remarks:
0 0	20	100	1.5	13 21 30	SS [76Q0087]					at 113.0 ft: color change to Dark brown [7.5YR 4/4], 35-40% fine grained sand, trace subrounded gravel up to 1".	
0 0	40	100	1.5	14 30 30	SS [76Q0088]		120			at 120.0 ft: with dark brown staining and caliche.	
0 0	40	100	1.5	17 23 36	SS [76Q0089]		125				
0	40	100	1.5	20 30 33	SS [76Q0095]		130			at 130.0 ft: 20-25% fine grained sand, 5% clay.	
0	40	100	1.3	15 39 50 1/4"	SS [76Q0096]		135			at 135.0 ft: hard.	
0	30	100	1.5	30 36 41	SS [76Q0110]	294.3	140			SANDY CLAY (CL): Dark brown [7.5YR 4/4], stiff to hard, dry to moist, 30-35% fine grained sand, 10-15% silt, low to medium plasticity.	
0	50	100	1.5	18 26 31	SS [76Q0097]	288.3	145			SANDY SILT (ML): Yellowish brown [10YR 5/4], stiff to very stiff, moist, 20-25% fine grained sand, trace clay, low plasticity.	
0	40	100	1.5	20 22 23	SS [76Q0111]		150			at 150.0 ft: color change to Dark yellowish brown [10YR 4/4].	

SS = SPLIT SPOON SAMPLER;
HP = HYDRO-PUNCH SAMPLER

SITE and LOCATION

Site 17 - Communication Sta. Landfill, MCAS El Toro

HOLE NO.

17NEW1



BOREHOLE LOG

PROJECT and JOB NUMBER

CLEAN II

22214-076

HOLE NO.

17NEW1

SHEET NO. 5 OF 6

Organic Va. % Reading (ppm)	Radiologic Reading (cpm)	Core/Soil Recovery (%)	Core Length/ Sampler Advance	Blow Counts or Recovery (ft)	Sampler Type/ BEDMS No.	Elevation in Feet	Depth in Feet	Graphics Sample/Recovery	Description and Classification	Remarks:
0	20	100	1.0	30 50/6"	SS [76Q0112]					
0	10	100	0.9	27 50/5"	SS [76Q0113]	266.8	160		at 160.0 ft: color change to Dark brown [7.5YR 4/4], ~40-45% fine grained sand, ~5% clay.	
0	30	100	0.9	27 50/5"	SS 76Q0010	263.8	165		SAND (SP): Very pale brown [10YR 7/4], very dense, moist, fine to medium, grained with ~5-10% coarse grains, trace to 5% silt.	
0	20	100	0.9	37 50/5"	SS [76Q0114]	256.3	170		SILTY GRAVEL (GM): Dark yellowish brown [10YR 4/4], very dense, moist, ~65-75% subrounded to subangular gravel up to 2", ~20-25% silt, ~5-10% fine grained sand.	Drilling problems with gravel being removed from hole.
0	40	100	1.5	10 23 50	SS [76Q0115]		175		SANDY SILT (ML): Yellowish brown [10YR 5/4], very stiff to hard, dry to moist, ~25-30% fine grained sand, trace clay.	
0	20	100	0.9	32 50/5"	SS [76Q0116]		180			Water added to remove cuttings from hole.
0	20	100	0.9	18 50/5"	SS [76Q0117]		185		at 185.0 ft: ~10-15% fine grained sand.	
0	20	100	0.7	48 50/2"	SS 76Q0011		190			

SS = SPLIT SPOON SAMPLER;
HP = HYDRO-PUNCH SAMPLER

SITE and LOCATION

Site 17 - Communication Sta. Landfill, MCAS El Toro

HOLE NO.

17NEW1

Template: NAVJVS-11/95

Project ID: EL076-sk-1



BOREHOLE LOG

PROJECT and JOB NUMBER

CLEAN II

22214-076

HOLE NO.

17NEW1

SHEET NO. 6 OF 6

Organic Vapor Reading (ppm)	Radiologic Reading (cpm)	Core/Soil Recovery (%)	Core Length/ Sampler Advance	Blow Counts or Recovery (ft)	Sampler Type/ BEIDMS No.	Elevation in Feet	Depth in Feet	Graphics	Description and Classification	Remarks:
0 0	40	100	1.5	19 15 23	SS [76Q0118]				at 195.0 ft: ~35-40% fine grained sand.	
0 0	20	100	0.4	50/5"	SS		200		at 200.0 ft: ~20-25% fine grained sand, hard.	
						228.3				
0 0	30	100	1.5	13 23 30	SS [76Q0119]		205		SILTY SAND (SM): Yellowish brown [10YR 5/4], dense, moist, ~60-65% fine grained sand.	
0 0	40	100	1.5	12 24 30 na	SS 76Q0017 HP 76Q1002		210 219.3		at 210.0 ft: color change to Dark yellowish brown [10YR 4/4].	Geotechnical sample at 210.5-211.0 ft.
			1.5						SANDY SILT (ML): Dark brown [10YR 3/3], very stiff, wet, ~30-35% fine grained sand, trace subangular gravel up to 0.5".	
0 0	40	100	1.5	13 18 22	SS [76Q0120]		215			
0 0	40	100	1.5	18 18 20	SS 76Q0012		220		at 220.0 ft: color change to Very dark grayish brown [10YR 3/2], ~40-45% fine grained sand, trace to 5% subangular to angular gravel up to 0.5".	
						207.3				
0 0	20	100	1.5	17 30 28	SS [76Q0121]		225		SILTY SAND (SM): Yellowish brown [10YR 5/4], dense to very dense, wet, ~60-65% fine grained sand.	Geotechnical sample at 226.0-226.5 ft.
0 0	40	100	0.4	50/5"	SS [76Q0122]		230			
						198.3				
									TOTAL DEPTH = 233.0 FT.	Monitoring well installed in hole after completion.

SS = SPLIT SPOON SAMPLER;
HP = HYDRO-PUNCH SAMPLER

SITE and LOCATION

Site 17 - Communication Sta. Landfill, MCAS El Toro

HOLE NO.

17NEW1

Template: NAVYS, 11/95

Project ID: ELD76, 4/1

**GEOPHYSICAL INVESTIGATION REPORT
(GEOVISION, JULY 2000)**

**SUMMARY REPORT
AERIAL PHOTOGRAPH ANOMALY 44**

DATED 3 NOVEMBER 2000



GEOPHYSICAL INVESTIGATION

Aerial Photographic Anomaly Area 44 Marine Corps Air Station, El Toro, California

GEOVision Project No. 0260

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July 20, 2000

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1 INTRODUCTION

A geophysical investigation was conducted on May 2 to July 5, 2000 in an approximate 9-acre area encompassing Aerial Photographic Anomaly Area 44, Marine Corps Air Station (MCAS), El Toro, California. The purpose of the investigation was to screen the site for buried metallic and/or construction debris and fill soils.

The geophysical survey area consisted of an open dirt field located southeast of Quarry Road and the Wherry Housing Area, northeast of Irvine Boulevard, and west of the Site 17 Landfill. Chain link fences parallel and perpendicular to Quarry Road formed the northwest and southwest edges of the survey area. The location of the survey area is shown on Figure 1.

There was no surficial evidence of disposal activities at the site, except possibly for several linear mounds of soil in the southeastern portion of the survey area, immediately west of the Site 17 Landfill. Surficial cultural features within the survey area that could adversely affect the geophysical data included monitoring wells, fences, and scattered surface debris.

Geophysical techniques used during this investigation included the magnetic and electromagnetic (EM) induction methods. These techniques complement one another as each responds to different physical properties or subsurface materials and has different strengths and limitations. The magnetic method was applied to this investigation because it has the greatest depth of investigation of the geophysical techniques typically applied to mapping buried metallic debris. However, this greater depth of investigation comes at the expense of lateral resolution. The EM induction technique was applied to this investigation because it can map both shallow buried metallic debris and variations in soil conductivity. Changes in soil conductivity may be used to infer the presence of fill soils, providing the fill has a different composition than native soils.

Geophysical techniques used during the investigation are discussed in Section 2. Field procedures are described in Section 3. Data processing and interpretation are discussed in Section 4. Conclusions are presented in Section 5, and our professional certification is presented in Section 6.

2 GEOPHYSICAL TECHNIQUES

This section presents background information on the magnetic and EM methods used during this investigation. A description of the geophysical methods used during this investigation, common applications of the methods, photographs of the instruments, and example applications are included in Appendix A.

2.1 Magnetic Method

The magnetometers used during this investigation consisted of a Geometrics G858 optically pumped cesium-vapor magnetometer (G858) and a GEM GSM-19 base station magnetometer. These instruments measure the intensity of the earth's magnetic field in nanoteslas (nT).

The earth's magnetic field is believed to originate in convection currents in the earth's liquid outer core. The magnetic field varies in intensity from about 25,000 nT at the equator, where it is parallel to the earth's surface to about 70,000 nT at the poles where it is perpendicular to the earth's surface. The intensity of the earth's magnetic field in North America varies from about 45,000 to 60,000 nT, and has an associated inclination that varies from about 60 to 75 degrees. The earth's magnetic field undergoes low-frequency diurnal variations (drift) caused by the earth's rotation. The magnetic field can also undergo short-period, high-amplitude variations during periods of sunspot activity called magnetic storms. Often magnetic field intensity can be so variable during a magnetic storm that meaningful magnetic data cannot be acquired. When it is necessary to correct for magnetic drift a base station magnetometer is set up in a quiet portion of the site and programmed to record total magnetic field intensity at fixed increments (i.e. 5-second intervals) throughout the day. This base station data is then used to remove the effects of drift from the field data. In small survey areas where the data is acquired over a small amount of time and the anomalies have large amplitudes correction for diurnal variation is not necessary.

Buried ferromagnetic objects give rise to local perturbations (anomalies) in the earth's magnetic field. In North America, these anomalies are often dipolar with a positive response south and a negative response north of the object. The dimensions and amplitude of a magnetic anomaly are a function of the size, mass, depth and magnetic properties of the source. Magnetometers can typically locate a metallic object the size of a 55-gallon drum to a depth of about 10 feet providing background noise levels are not too high and the object is not significantly corroded. Larger metallic objects can be located to greater depths. The magnetic anomaly due to an object the size of a 55-gallon drum is expected to have dimensions of greater than 10- by 10-feet. Magnetometers are not able to detect nonferrous metals such as aluminum or brass.

Typical applications of the magnetic method include:

- Locating pits and trenches containing ferrous metallic debris
- Locating buried drums, tanks and pipes
- Delineating boundaries of landfills containing ferrous debris
- Locating abandoned well casing
- Detecting unexploded ordnance
- Mapping basement faults and geology

- Mapping archeological sites.

Some advantages of magnetic surveys are:

- Rapid – modern instruments can acquire up to 10 readings per second as the operator walks down survey lines
- Depth of investigation – magnetometers can often locate buried ferrous metallic objects to greater depths than other methods
- Anomalies are much larger than the source allowing for larger line spacing in some situations

Some limitations of the magnetic surveys are:

- Unable to detect nonferrous metals such as aluminum or brass
- Magnetic anomalies are unsymmetrical and much larger than the source and it can, therefore, be difficult to determine the precise locations and size of the source
- Ineffective in areas having extensive metallic debris at the surface as no distinction can be made between anomalies caused by surface and buried debris
- Metallic structures such as buildings, fences, reinforced concrete, and light posts interfere with the measurements
- High voltage powerlines can often strongly interfere with the measurements
- Data can be very noisy in areas containing volcanic rock, specifically basalt

2.2 Electromagnetic Induction Method

EM induction equipment used during this investigation consisted of a Geonics EM-31 terrain conductivity meter (EM-31) coupled to a digital data logger. The EM-31 consists of a transmitter and receiver coil, one at each end of 12-foot long boom. An alternating current is applied to the transmitter coil, causing the coil to radiate a primary EM field. This primary EM field generates eddy currents in subsurface materials, which give rise to a secondary EM field. The EM-31 measures the components of the secondary EM field both in-phase and 90-degrees out-of-phase with the primary EM field. The out-of-phase component is converted to apparent conductivity in millisiemens per meter (mS/m) and the in-phase component is measured as parts per thousand of the primary EM field. A negative EM-31 response with positive shoulders is generally observed over shallow, buried metallic objects. The EM-31 can locate both ferrous and nonferrous metallic objects and can locate a metallic object the size of a 55-gallon drum to a maximum depth of about 5 feet. The EM-31 must pass directly over or immediately adjacent to a buried metallic object to detect it. Because of the 12-foot separation between the transmitter and receiver coils, the EM-31 cannot detect very small, buried metallic objects. The EM-31 can also map changes in the electrical conductivity of subsurface soils caused by certain types of conductive contaminants (i.e. brines, drilling mud, chloride, metals, etc.) or simply a change in soil type (i.e. low conductivity sand to high conductivity clay).

Applications of EM Induction methods include:

- Locating buried tanks

- Locating pipes and utilities
- Locating pits and trenches containing metallic and/or nonmetallic debris
- Delineating landfill boundaries
- Delineating oil production sumps and mud pits
- Mapping conductive soil and groundwater contamination
- Mapping soil salinity in agricultural areas
- Characterizing shallow subsurface geology
- Mapping buried channel deposits
- Locating sand and gravel deposits
- Mapping conductive fault and fracture zones
- Mapping lateral variation in subsurface soil type

Strengths of EM Induction Methods include:

- Rapid – data can be acquired at a slow walking pace
- Locate both metallic and some nonmetallic targets
- Better resolution than magnetometer
- Not as sensitive to very small surface debris as other methods
- Can locate electrical and telephone cables which often cannot be located by other methods
- Anomalies of buried objects have simple shape facilitating identification and positioning of the source

Limitations of EM Induction Methods include:

- Metallic structures such as buildings, fences, reinforced concrete, and light posts interfere with the measurements
- High voltage powerlines can often strongly interfere with the measurements
- Depth of investigation not as great as that of a magnetometer for detection of buried ferrous metallic objects
- Highly variable soil conductivity can complicate quadrature component interpretation

3 FIELD PROCEDURES

This section describes the field procedures used during the investigation, including site preparation, magnetic and EM-31 survey procedures, and field verification procedures.

3.1 Site Preparation

Before conducting the geophysical investigation, 4-foot long survey lathe were placed at 20-foot intervals along the southwest (SW) and northeast (NE) edges and in the middle of the approximate 550- by 550- foot original survey area to provide control for the geophysical survey. The survey area was later expanded to the southeast (SE) to map the extents of an anomalous zone located in the southeastern portion of the original survey area. The survey expansion was about 350- by 300-feet in size.

A Sokkia GIR1000 single-frequency global positioning system (GPS) was coupled to the geophysical instruments to provide horizontal control for the geophysical data. Differential corrections were applied to the GPS data using GPS base station data recorded at the Sokkia office in Orange, California. GPS data were collected in geodetic coordinates based on the WGS84 system and transformed to approximate California State Plane Coordinates, Zone 6, North American Datum of 1983 (NAD83) after applying differential corrections. Ellipsoid heights measured using the GPS system were converted to NAVD 88 elevations using the Geoid Model of 1996. Maximum horizontal errors in the corrected GPS data are estimated to be about 3 feet, with average errors being about 1 to 2 feet.

The GPS system was also used to map pertinent surficial features at the site, including dirt roads, monitoring wells, fences, and surface debris. Additionally, the GPS system was used to relocate geophysical anomalies during the field verification phase. Site mapping activities were conducted on May 3, May 11, and July 5, 2000.

A site map showing the location of the geophysical survey area, State Plane Coordinate System, and surficial features is presented as Figure 2.

3.2 Magnetic Survey

Original magnetic data were acquired on May 2 to 3, 2000. On June 13, 2000 the survey was expanded to the southeast to map an anomalous zone extending beyond the original survey area. Prior to data acquisition, the base station magnetometer was set up north of the survey area in a location free of surface debris. The internal clock of the base station and G858 were synchronized to GPS time and the base station was programmed to record the magnetic field intensity of the earth at 5-second intervals throughout the day. The G858 and GPS unit were then programmed with the appropriate settings. The magnetometer was operated with the sensor about 3 feet above ground surface. Measurements of the earth's total magnetic field intensity were made at 0.2-second intervals as the operator walked along SW-NE survey lines nominally spaced 10 feet apart. The 0.2-second sampling interval resulted in an average station spacing of about 1 foot. The stakes placed at the ends and middle of the survey area allowed the instrument

operator to walk a relatively straight line, thereby ensuring uniform site coverage. It was not possible to walk straight lines in all areas due to heavy vegetation, large shrubs and trees, and soil mounds. The magnetic data were stored in the internal memory of the magnetometer, along with line number, and time of measurement. If an error was made on a survey line the line was deleted from the magnetometer's internal memory and reacquired. GPS, base station and field magnetic data were downloaded to a laptop computer at the end of the magnetic survey.

3.3 Geonics EM-31 Survey

EM-31 data were acquired concurrently with magnetic data on May 2 to 3, and June 13, 2000. Prior to data acquisition, the EM-31 was assembled and battery levels were checked and found to be within acceptable levels. The in-phase component was then set to zero in a portion of the site with no buried metallic objects. The EM-31 digital data logger was synchronized to GPS time and programmed with the appropriate file name, line number, measurement increment, and direction. Changes in these parameters were made as necessary throughout the survey. The EM-31 was operated in vertical dipole mode with an approximate 3-foot instrument height and the instrument boom parallel to the survey lines. EM-31 measurements of conductivity and in-phase component were made at 0.5-second intervals as the operator walked along SW-NE survey lines nominally spaced 10 feet apart. The 0.5-second sampling interval resulted in an average station spacing of about 2 feet. The EM-31 data were stored in a digital data logger along with line and station number. If an error was made acquiring a line, a note was made in the field log and the line repeated. EM-31 and GPS data were downloaded to a laptop computer at the end of each field day.

3.4 Field Verification

The verification phase of the investigation was conducted on July 5, 2000 after processing of the magnetic and EM-31 data. A discussion of data processing procedures is provided in the following section. Most magnetic and EM-31 anomalies were relocated with GPS and field checked to verify that they had subsurface sources. This phase of the investigation revealed that about half of the small geophysical anomalies were caused by small pieces of surface debris and that the most significant geophysical anomalies had subsurface sources. Two pipes along the NW edge of the survey area were traced with an EM utility locator and surveyed using GPS. Additional surface features such as monitoring wells and test pit locations located SE of the survey area were surveyed for spatial reference.

4 DATA PROCESSING AND INTERPRETATION

This section presents the data processing procedures and interpretation of the geophysical data.

4.1 Data Processing

Color-enhanced contour maps of magnetic and EM-31 data were generated using the GEOSOFT® geophysical mapping system. Prior to contour map generation, a number of preprocessing steps were completed. These preprocessing steps consisted of the following:

- Backup of all original field data files to floppy disk.
- Downloading GPS base station data from Sokkia bulletin board.
- Applying differential corrections to GPS data and outputting an ASCII file containing approximate State Plane Coordinates, elevation, and time.
- Correcting of all data acquisition errors (typically only deleting the first portion of a reacquired line, renaming lines incorrectly labeled, deleting additional readings outside the grid, etc.)
- Reformatting field data files to free format XYZ files containing at a minimum GPS time and field measurements.
- Merging GPS position data and geophysical data using in-house software.
- Removing diurnal variation from total magnetic field measurements using the base station data file and in-house software, if necessary.
- Merging of multiple data files into a single file and sorting, if necessary.

These data adjustments were made using a combination of commercial and in-house software. All adjustments made to data files and resulting file names were documented and are retained in project files.

The outputs of the data preprocessing were data files containing California State Plane, Zone 6, NAD83 Easting and Northing, and the various data measurements. The magnetic data file contained total magnetic field intensity. The EM-31 data file contained conductivity and in-phase response.

These data files were imported into the GEOSOFT® mapping system and the following data processing steps applied:

- Reformatting of data files to GEOSOFT® format.
- Generating final map scale.
- Gridding data using minimum curvature and a 5-foot cell size.
- Masking grid in areas where data not acquired (i.e. around obstructions).
- Applying a single pass Hanning filter to smooth the data.
- Generating color zone file describing color for different data ranges.
- Contouring the data.
- Generating map surrounds (title block, legend, scale, color bar, north arrow, etc.)
- Annotating anomalies.
- Merging various plot files and plotting final map.

The names of the files generated and the processing parameters used were recorded on data processing forms. All completed data processing forms are retained in project files. All files generated during the processing sequence were archived on CD-ROM.

4.2 Interpretation

Color-enhanced contour maps of total magnetic field intensity, EM-31 conductivity and EM-31 in-phase response are presented as Figures 3 to 5, respectively. The coordinates shown in these figures reference the California State Plane Coordinate System, Zone 6, NAD83. The color bar indicates the amplitude of the measured quantity with the magenta and cyan colors indicating high- and low-amplitudes, respectively. The light orange, yellow and light green colors in the contour maps of total magnetic field intensity and EM-31 in-phase response indicate average "background" values of the measured quantity.

Significant anomalies in the magnetic and EM-31 data were field checked to determine if a metallic object at the surface caused the anomaly. A number of surface metallic features, such as fences, monitoring wells, and metallic surface debris caused anomalies in the geophysical data. These anomalies are labeled as "SM" on the contour maps.

There is an anomaly on the contour maps of magnetic and EM-31 data (Figures 3 to 5) interpreted as being caused by a buried pipe(s). This anomaly is labeled as "P" on the contour maps and approximate locations of the pipes are shown on Figure 2.

There are numerous small magnetic anomalies and several small EM-31 anomalies interpreted as being caused by small, buried metallic objects. These anomalies are labeled as "B" on the respective contour maps and are depicted on Figure 2. The anomalies are probably caused by small pieces of metallic debris at shallow depth. This debris is probably similar to the debris scattered on the surface. Some of the anomalies interpreted as buried objects appear to have larger sources, as depicted by a different symbol on Figure 2. These larger anomalies may be caused by small pits containing metallic debris or large buried objects (i.e. piece of sheet metal, large pipe segment, etc.)

There are three large anomalous areas in the magnetic data requiring further discussion. These anomalies are labeled as A-1 to A-3 on the contour map of magnetic data (Figure 3) and are discussed below.

Anomaly A-1 consists of a small area centered at 6118350E, 2191700N with abundant, high-amplitude magnetic anomalies and sparse EM-31 anomalies. This anomalous zone is interpreted as an area containing a high concentration of buried metallic debris as shown on Figure 2. The absence of EM-31 anomalies over most of this area indicates that much of the debris may be greater than 5 feet in depth. Alternatively, some of the debris may just be too small to give rise to EM-31 anomalies, although the sources of the larger magnetic anomalies should be large enough to give rise to EM-31 anomalies, if at shallow depth.

Anomaly A-2 is located immediately SE of A-1 and consists of lower amplitude, less concentrated magnetic anomalies. This anomalous zone is interpreted as an area containing scattered buried metallic debris. There is a minor amount of surface debris in this area and much of the buried debris may consist of small, buried objects at relatively shallow depth. The specific interpreted locations of the buried metallic debris in this area are shown on Figure 2.

Anomaly A-3 is located immediately SE of A-2 and has similar characteristics to A-2; however most of the anomalies appear to be caused by surface debris. This anomalous zone is located in a portion of the site containing parallel, linear soil mounds and is interpreted as an area containing scattered surface debris and minor buried debris. The buried debris probably consists of small pieces of debris at shallow depth. Stakes identifying former test pit locations indicate that the Site 17 landfill is located immediately SE of anomaly A-3 and the soil mound area. An absence of significant buried debris within the soil mound area indicates that the mounds may have been present at the time of landfilling. If this assumption is correct, then anomalies A-2 and A-1 may be westward extensions of the landfill.

The EM-31 conductivity data (Figure 4) provided no conclusive evidence for the placement of large amounts of fill soil. Near-surface soil conductivities are quite variable at the site, ranging from about 14 to 34 mS/m. The near-surface soils in the lower conductivity zones probably consist of coarser grained soils with only minor amounts of clay (i.e. clean sand), whereas the higher conductivity zones probably have silty sands, clayey sands or silt in the near surface. Soil conductivity varies from about 14 to 18 mS/m over much of the site and this conductivity range will be considered background for the purpose of discussion. A NW trending zone of slightly elevated conductivity (above background) is identified as anomaly A-4 on Figure 4. Much of magnetic anomalies A-1 and A-2 are located within this area, which may lead one to conclude that the elevated conductivities are somehow related to disposal activities at the site. However the orientation of this elevated conductivity zone is not parallel to magnetic anomalies A-1 and A-2 and the adjacent Site 17 landfill, indicating that the conductivity variation may just be related to natural soil deposition. Soil conductivity is also beginning to increase along the NE edge of the survey area providing additional evidence that near-surface soils are somewhat variable across the site. Soil conductivity is also slightly elevated in parts of a heavily vegetated area in the SW portion of the survey area (Figure 2 and 4). This heavily vegetated area is located at the end of a very small intermittent drainage, and the elevated conductivity may be related to the accumulation of fine-grained sediments. It should be noted that this minor drainage appears to pass through or adjacent to the Site 17 landfill.

5 SUMMARY

A magnetic and Geonics EM-31 (EM-31) survey was conducted in the approximate 9-acre Aerial Photographic Anomaly Area 44 at MCAS EL Toro, California to screen the site for buried metallic and/or construction debris and fill soils. Interpretation of the geophysical data is presented in Figure 2. Contour maps of total magnetic field intensity and EM-31 conductivity and in-phase response are presented as Figures 3 to 5, respectively.

The geophysical survey revealed the presence of a large area containing buried metallic debris in the southeastern portion of the site. This area is subdivided into three zones referred to as A-1 to A-3 in Figure 2, and may be considered a westerly extension of the Site 17 landfill. The Site 17 landfill is currently mapped as terminating at the eastern edge of a series of narrow, northeast trending soil mounds. Very little evidence of buried metallic debris was found in the geophysical data collected in the soil mound area, indicating that the soil mounds may have been present in during landfilling activities. Anomalous zone A-3, interpreted as scattered surface debris with only minor amounts of buried debris, is located within the soil mound area as shown on Figure 2. Buried metallic debris is however found northwest of the soil mounds (areas A-1 and A-2 on Figure 2). The westernmost anomalous zone (A-1) is interpreted as containing significant amounts of buried metallic debris, possibly at depths of greater than 5 feet. The central zone (A-2) is interpreted as containing scattered buried metallic debris with the specific interpreted locations of debris presented on Figure 2. These two areas (A-1 and A-2) could be considered part of the Site 17 landfill, however they appear to be separated from the main landfill by the soil mound area.


The geophysical data also revealed the presence of two pipes along the northwestern edge of the survey area and numerous small, buried metallic objects/debris as shown on Figure 2. Most of the buried metallic objects appear to be very small, shallow pieces of debris, probably similar in nature to the surface debris scattered around the site. Some of the buried metallic debris/objects are larger, as depicted by a different symbol on Figure 2. These larger buried metallic features may consist of small pits containing metallic/construction debris or buried metallic objects with dimensions of several feet on a side.

Near-surface soil conductivity is quite variable at the site ranging from about 14 to 34 mS/m. Much of the conductivity variation is probably related to natural soil variation. A large northwest trending zone of elevated conductivity passes through the anomaly A-1/A-2 area; however, this is probably a coincidence, as the two features appear to have different orientations. Soil conductivities are also slightly higher in a heavily vegetated area in the southwestern portion of the survey area that is the terminus of a very small, intermittent drainage. This drainage appears to pass adjacent to or through the Site 17 landfill. Several shallow soil samples could be collected to confirm that the variation in soil conductivity at the site is a function of soil type rather than some other feature.

The geophysical survey was designed to map small accumulations of metallic debris in the subsurface and strong variations in near-surface soil type that could be indicative of fill soils. It was assumed that any debris buried at the site would contain enough metallic components (i.e. rebar, pipe segments, steel plates, etc.) to be detectable by the magnetic and EM methods.

6 CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a **GEOVision** California Registered Geophysicist.


Antony J. Martin
California Registered Geophysicist GP989
GEOVision Geophysical Services



7/21/03
Date

- * This geophysical investigation was conducted under the supervision of a California Registered Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

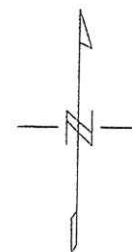
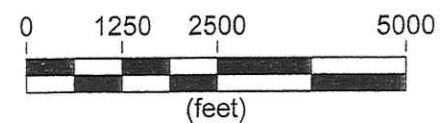
A registered geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

FIGURES

APPROXIMATE
BOUNDARY OF
MCAS EL TORO

GEOPHYSICAL
SURVEY AREA -
AERIAL
PHOTOGRAPHIC
ANOMALY AREA 44

- NOTES:
1. BASE MAP PROVIDED BY THE IT GROUP
 2. COORDINATES ARE IN THE CALIFORNIA STATE PLANE COORDINATE SYSTEM, ZONE 6, NAD83
 3. ESTIMATED MAP ACCURACY = 10-30 FEET



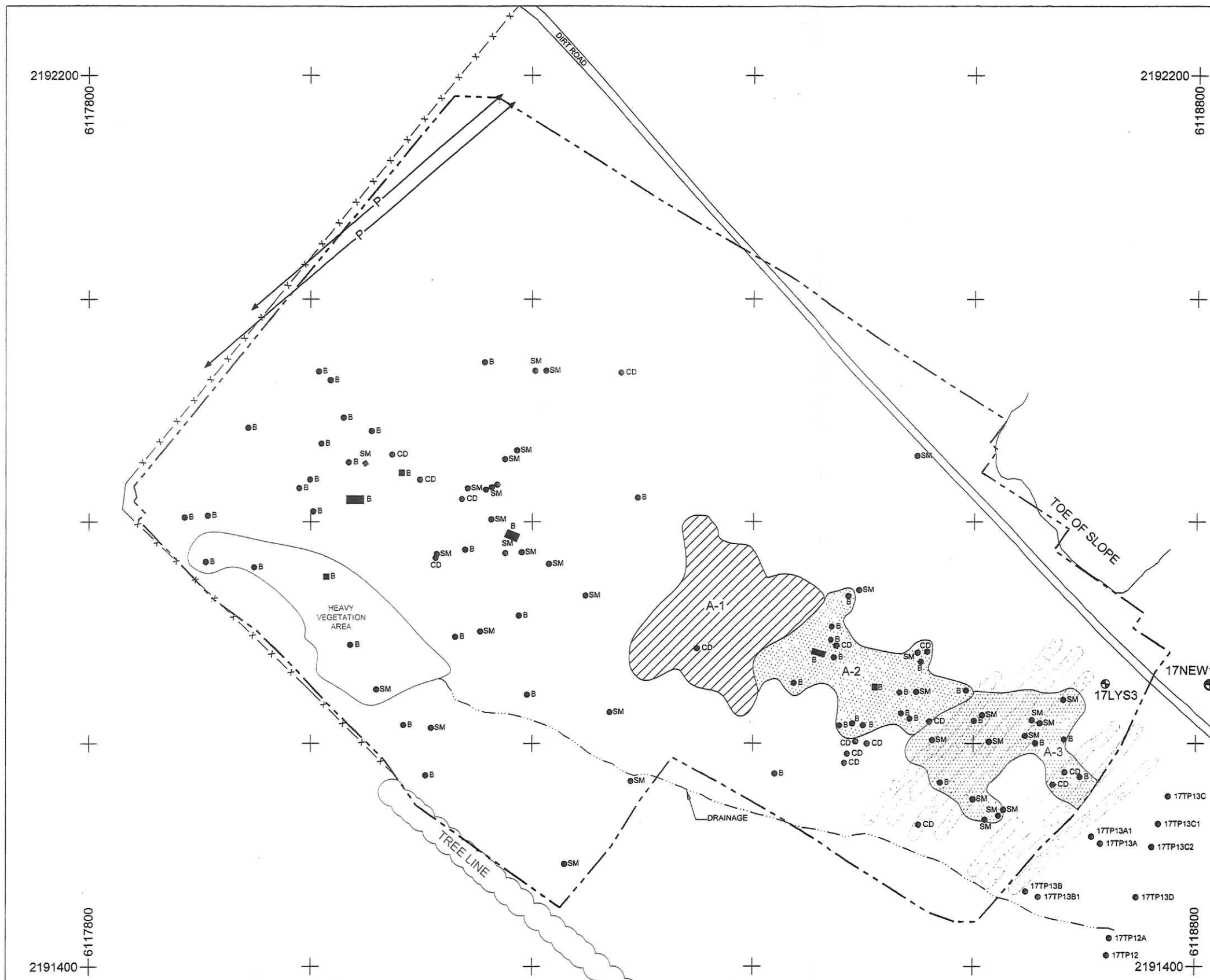
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Project No. 0260-44	Date Jul 20, 2000
Developed by A MARTIN	
Drawn by T RODRIGUEZ	
Approved by	
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FIGURE - 1 SITE LOCATION MAP

MARINE CORPS AIR STATION, EL TORO
ORANGE COUNTY, CALIFORNIA

PREPARED FOR
THE IT GROUP



NOTES:
1. COORDINATES ARE IN CALIFORNIA STATE
PLANE COORDINATE SYSTEM, ZONE 6, NAD83

LEGEND

- ESTIMATED STATE PLANE COORDINATES
- BOUNDARY OF GEOPHYSICAL SURVEY AREA
- CHAIN LINK FENCE
- CONCRETE DEBRIS
- SURFACE METALLIC OBJECT / DEBRIS
- PIPE
- VERY SMALL BURIED METALLIC OBJECT / DEBRIS
- BURIED METALLIC OBJECT / DEBRIS
- AREA CONTAINING HIGH CONCENTRATION OF BURIED METALLIC OBJECTS / DEBRIS
- AREA CONTAINING SCATTERED BURIED METALLIC OBJECTS / DEBRIS
- AREA CONTAINING SCATTERED SURFACE AND MINOR BURIED METALLIC OBJECTS / DEBRIS
- STAKED TEST PIT LOCATION
- SOIL MOUND
- MONITORING WELL
- LYSIMETER

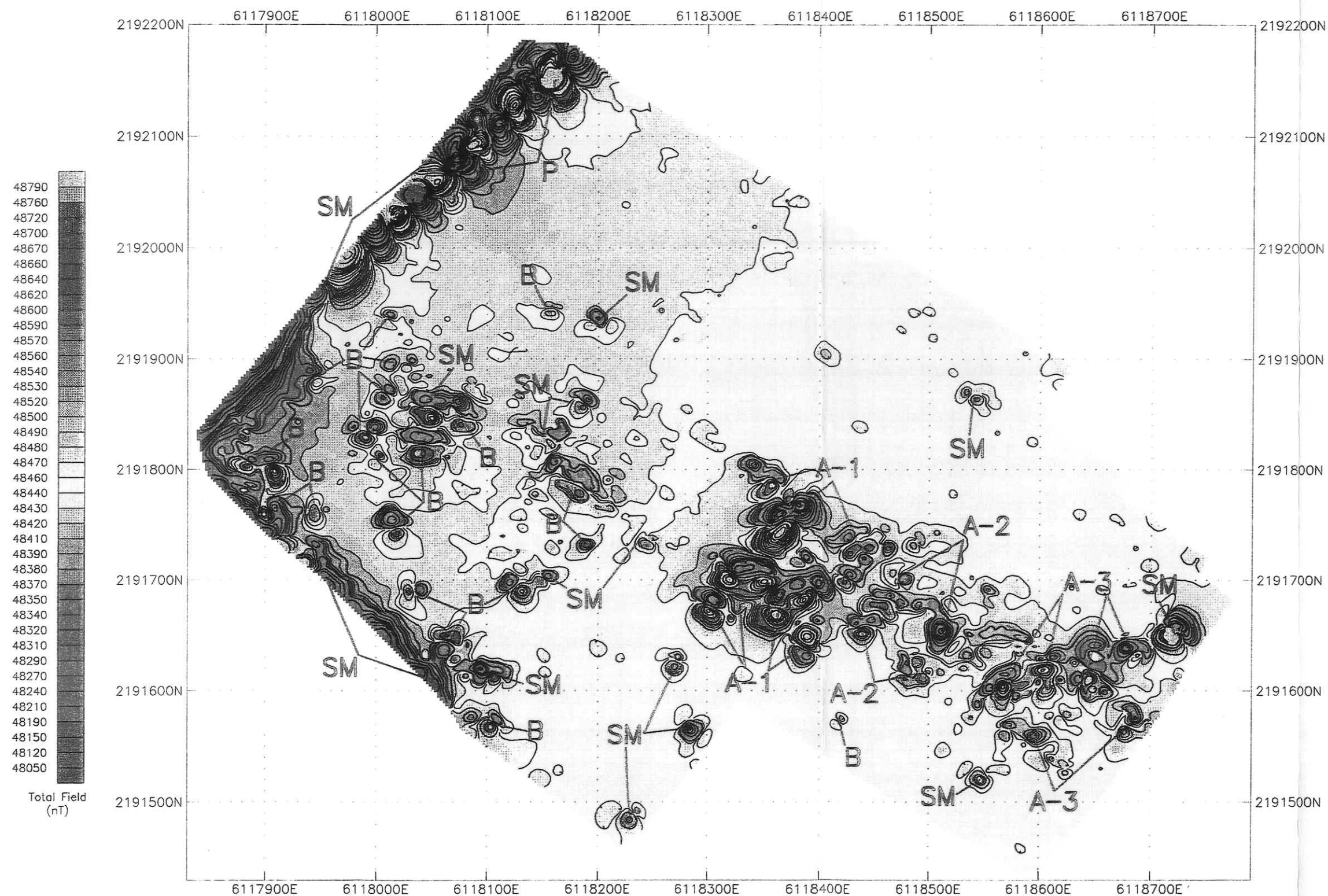
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Project #	0260
Date	Jul 20, 2000
Developed by	A MARTIN
Drawn by	T RODRIGUEZ
Approved by	<i>[Signature]</i>
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FIGURE - 2
SITE MAP WITH GEOPHYSICAL INTERPRETATION

AERIAL PHOTOGRAPHIC ANOMALY AREA 44
MCAS EL TORO
ORANGE COUNTY, CALIFORNIA

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Total Field
(nT)

CONTOUR INTERVAL = 20 NANOTESLAS

Note: Coordinates are in the California State
Plane Coordinate System, Zone 6, NAD83

LEGEND

- A-1** GEOPHYSICAL ANOMALY
DISCUSSED IN REPORT
- P** ANOMALY CAUSED BY BURIED PIPE
- B** ANOMALY CAUSED BY SMALL BURIED
METALLIC OBJECT OR DEBRIS
- SM** ANOMALY CAUSED BY SURFACE
METALLIC OBJECT OR DEBRIS

50 0 50 100 150
(feet)

FIGURE 3
CONTOUR MAP OF TOTAL MAGNETIC FIELD INTENSITY

AERIAL PHOTOGRAPHIC ANOMALY AREA 44
MCAS EL TORO, CALIFORNIA

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